THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXVI. No. 639.] LONDON, AUGUST 10, 1875. [27TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis—10,000 cubic feet of gas per ton of coal; 28-candle gas; 13¼ cwt. coke per ton of coal.
The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.
RAMSAY'S PATENT CONDENSED COKE.
DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.
GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES. CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.
Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne; and London Wharves—Falcon Wharf, No. 80, Bankside; and Honduras Wharf, Cubit Town. Large stocks kept.
Address G. H. RAMSAY, NEWCASTLE-ON-TYNE.

GENUINE TORBAY PAINT
AND
SPECIAL GASOMETER PAINT
(Mixed ready for use).
These Paints are now used in 100 Country Gas-Works, and by all (but one) of the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. They will cover tar effectually. Also used by the Admiralty, War Office, Railway Companies, Founders, &c.
They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
STEVENS & CO.,
(SUCCESSORS TO SAMUEL CALLEY. ESTABLISHED 20 YEARS.)
21, GT. WINCHESTER ST., LONDON.
WORKS: BRIXHAM, TORBAY.

PROUD'S
SPECIALITIES IN WOOD GRIDS
FOR
PURIFIERS & SCRUBBERS
MADE FROM THE BEST QUALITY
OF
WELL-SEASONED PLANKS.
BROOKFIELD WORKS,
103, ICKNIELD STREET EAST,
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COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and other OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Coal Office,
QUAY SIDE, NEWCASTLE-ON-TYNE.
JOS. COWEN & Co. are the only Manufacturers of FIRE-BRICKS and CLAY RETORTS at BLAYDON BURN.

JOHN RUSSELL AND CO.,
THE WEDNESBURY TUBE-WORKS, WEDNESBURY;
AND
THE ALMA WORKS, WALSALL.
Established at the commencement of Gas Lighting.
WAREHOUSES:
69, UPPER THAMES STREET;
COMMERCIAL STREET, SPITALFIELDS;
5, CHARLES STREET, SOHO; and
16, SOHO SQUARE,
} LONDON
35, 36, 37, & 39, GRANBY ROW, MANCHESTER.
J. R. and Co. are the original manufacturers of Wrought-Iron Gas Tubes and Fittings, and Inventors of the LAP-WELDED TUBES for Locomotive and Marine Boilers.
J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water; Gun-Metal Cocks, Stocks, and Dies; Galvanized Tubes and High-Pressure Tubes, &c.
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JOHN BENT & SON,
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MANUFACTURERS OF
WET AND DRY GAS-METERS,
OF
FIRST-CLASS MATERIALS & WORKMANSHIP;
Also, STATION-METERS, PRESSURE-GAUGES, STREET-LAMPS, REGULATORS, &c.
ESTABLISHED 1830.

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MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
SUGAR, SALTPETRE, AND ALL KINDS OF PANS.
Roofs, Girders, and Bridges, and General Smith's Work.
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J. & H. ROBUS,
CONTRACTORS
FOR THE
ERECTION OF NEW & REMODELLING OF EXISTING GAS-WORKS.
RETORT-SETTING A SPÉCIALITÉ.
RETORTS SET, AND GUARANTEED TO BURN OFF A CERTAIN AMOUNT OF COAL, OR ELSE NO MONEY TAKEN FOR THE CONTRACT.
PLANS ON APPLICATION.
Retort-Setters sent to all parts of Europe and America.
Address, J. and H. ROBUS,
BELL GREEN, CATFORD, LONDON, S.E.

THE
NITSHILL COMPANY'S
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
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GEORGE GLOVER & CO.,
PATENTEES OF THE
NATIONAL STANDARD GASOMETERS
For the English Government, and for the Government of the Netherlands;
MAKERS OF THE DUPLICATE COPY
Presented by Her Majesty's Government to the French Government;
AND MANUFACTURERS OF
IMPROVED
DRY GAS-METERS,
Warranted to Measure correctly, and not to vary.
RANELAGH WORKS, RANELAGH ROAD, PIMLICO, LONDON, S.W.;
236, GEORGE STREET, GLASGOW; AND 30, LANCASTER AVENUE, MANCHESTER.

G. G. and Co. have received the only Medal awarded for Gas-Meters at the Vienna International Exhibition.

SILVER MEDAL, PARIS EXHIBITION, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,

MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS

AND

LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES.

Boiler-Tube Ferrules, Gun-Metal Gland Cocks, Water-Gauges, Whistles, &c.; Stocks, Taps, and Dies for Screwing, and Gas-Fitters Tools.

London Offices: No. 4, Cloak Lane, Queen Street, E.C.

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LIVERPOOL: No. 63, Paradise Street.
MANCHESTER: Barlow's Croft, Chapel Street, Salford.
PARIS: No. 38, Rue du Chateau d'Eau.
LILLE: No. 38, Rue Grande Chaussee.

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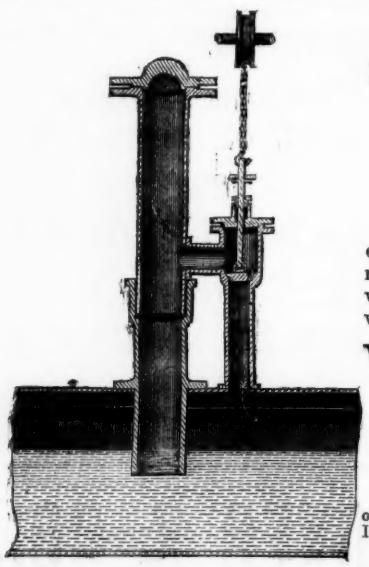
MANUFACTURERS OF

GAS-METERS, GOVERNORS, EXPERIMENTAL GASHOLDERS, &c.

HENRY THOMAS, Managing Director.



COPP'S PATENT GAS APPARATUS

For the Removal of all Pressure caused by the Hydraulic Seal;

THE EFFECTS PRODUCED BEING

1.—A LARGE INCREASE IN THE YIELD OF GAS.

2.—AN ENTIRE PREVENTION OF THE DEPOSIT OF CARBON.

3.—THE ASCENSION-PIPES DO NOT CHOKE.

The apparatus is very simple in construction, and cannot get out of order, and being an outside addition to the present arrangement of works, can be applied so easily as to require no alteration of plant. It may be fitted whilst the retorts are in use, without interfering with the manufacture of gas. The cost is so small that the outlay will be repaid in a few weeks' working. For further particulars apply to the Patentee,

W. L. COPP, WATCHET GAS-WORKS, SOMERSET,

or, 232, BRIXTON ROAD, LONDON, S.W.

The following is the opinion of JAMES PATERSON, Esq., President of the British Association of Gas Managers:—

WARRINGTON, *July* 12, 1875.

DEAR SIR,—I am obliged by your drawings, and cannot but say to you that I entertain a favourable opinion of your patent arrangements for the removal of the hydraulic seal when the retorts are in operation. It appears to be amongst the best, and probably the best, of the various devices in use for that purpose.

Mr. W. L. COPP. Yours truly, JAMES PATERSON.

TRADE MARK

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.;

GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

London Agent: W. G. DAVIS, 2, BRABANT COURT, PHILPOT LANE, E.C.

JOSEPH AIRD,

WELLINGTON TUBE-WORKS, TIPTON, STAFFORDSHIRE,

MANUFACTURER OF

EVERY DESCRIPTION OF TUBING, GAS, STEAM, HYDRAULIC TUBES AND FITTINGS,
EITHER BLACK, GALVANIZED, OR ENAMELLED HOT WATER TUBES AND FITTINGS,
CORE BARS, COILS, COCKS (IRON OR BRASS),
CHANDELIERS, &c., GAS-FITTERS' TOOLS, GAS TONGS, STOCKS, TAPS, DIES, &c., &c.,
HANDRAIL TUBINGS, IRON AND BRASS, PLAIN OR TWISTED,
TELEGRAPH TUBES OR POLES, &c., &c.

JOHN WRIGHT AND CO., ESSEX WORKS, BIRMINGHAM,

Beg to call the attention of MANAGERS and DIRECTORS of GAS COMPANIES to the following letter which they have lately received.

COPY OF LETTER RECEIVED FROM MAGNUS OHREN, Esq.

To Messrs. John Wright and Co., Essex Works, Birmingham. *Crystal Palace District Gas Company, Lower Sydenham, S.E.*

Dear Sirs,—In reply to your inquiries, I am glad to state that the use of GAS COOKING AND HEATING STOVES has been a complete success here. We have several hundred in use in our districts. We also find it advantageous to let out Stoves at a small rental. We have now 275 Stoves at rent.

The Stoves you make I can with confidence recommend, having so many in use, and giving satisfaction. I need scarcely point out to you the advantage to Gas Companies to recommend the use of Gas Stoves to their Gas Consumers, even where they do not supply them on sale or rent, as the use of Gas Stoves brings day consumption, and thus the Company make a profit by day as well as by night.—I am, dear sirs, yours faithfully, MAGNUS OHREN.

Size, 25½ in. high; 14 in. wide; 12½ in. back to front.

Price 50s., complete with Pan and Gridiron.

GAS HEATING STOVES

(TERRA COTTA AND IRON).

THE CHEERFUL STOVE.

COOKING STOVES.

BREAKFAST COOKERS.

BATHS HEATED by GAS

GAS STOVES

For Boiling, Broiling, Preserving, Heating Flat Irons, and for all other Domestic Purposes.

Gas Companies and the Trade who have not our Illustrated Catalogue are respectfully requested to apply for same.

A LIBERAL DISCOUNT to the TRADE.

No. 4003.

THE CHEERFUL GAS STOVE, with Copper Reflector,

Has all the appearance of a Bright Fire.

PRICE from 32s.

Established

1795.

JOSEPH CLIFF & SON,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

MANUFACTURERS OF ALL DESCRIPTIONS OF

FIRE GOODS, and Salt-Glazed Drain-Pipes.

LONDON WHARF:

Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL—1, Back Leeds Street,

Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

M. SELIG JUNIOR AND CO.,

IMPORTERS OF

AMERICAN AND OTHER FOREIGN TOOLS AND MACHINERY,

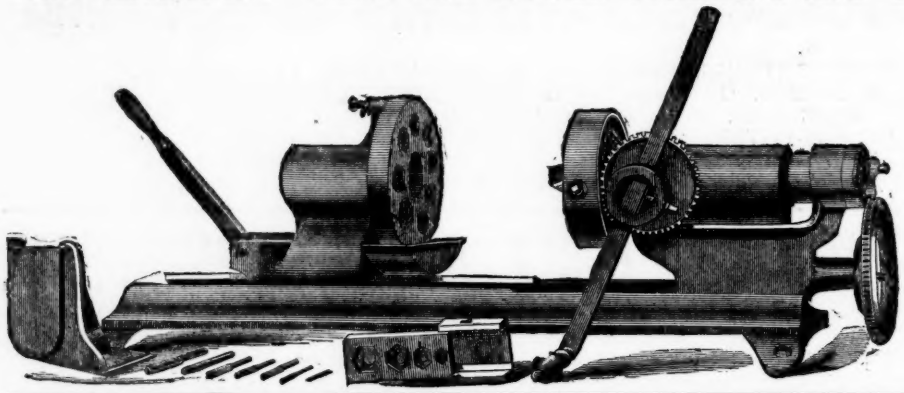
WHOLESALE AND EXPORT MACHINERY MERCHANTS,

SOLE EUROPEAN AGENTS FOR THE

"TANITE" COMPANY'S SOLID EMERY WHEELS AND MACHINERY,

85, QUEEN VICTORIA STREET, LONDON, E.C.

THE "LIGHTNING" HAND AND POWER SCREWING AND TAPPING MACHINES.



They finish their work at one cut.

Nuts and bolts threaded with them always correspond, without trying and fitting.

The dies are adjustable for wear.

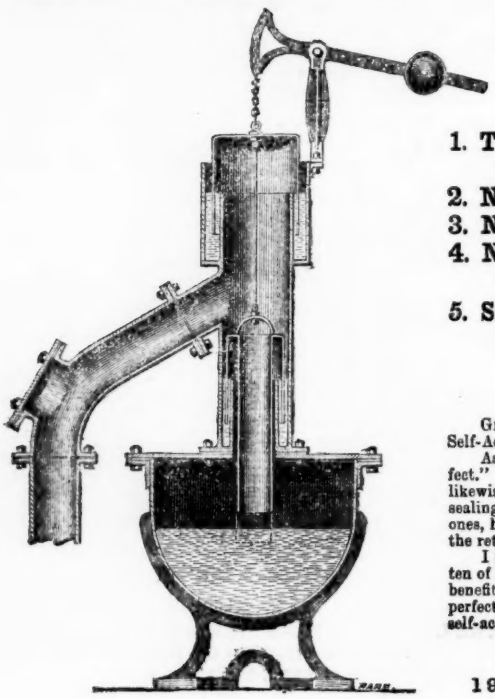
They thread 30 $\frac{3}{4}$-in. bolts, and tap 30 $\frac{3}{4}$-in. nuts, in 40 minutes—a day's work by hand.

They may be used, if pipe-dies ordered, for threading pipes as well.

SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



ADVANTAGES.

1. There is no pressure on the Retorts.
2. No deposit of Carbon.
3. No scurfing is required.
4. Never a choked Ascension-Pipe.
5. Saves Fuel and Wear and Tear.
6. Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7. Is never out of order.
8. Requires no attention.
9. Is perfectly automatic in its action.

TESTIMONIAL.

Metropolitan District Asylum, Caterham, Surrey, Dec. 14, 1874.

MESSRS. CHANDLER AND STEVENSON.

GENTLEMEN,—I have much pleasure in bearing testimony to the complete working of your "Patent Self-Acting Dip-Pipes," which have now been in constant operation over three months.

As regards the action of the apparatus, I can describe it no better than by calling it "simply perfect." Immediately the retort is charged and the lid secured, the small holder rises, which lifts the Dip; likewise the instant the gas is permitted to escape at the mouthpiece the holder falls, thus perfectly sealing the Dip. I am fully convinced of the superiority of these Self-Acting Dips over Non Self-Acting ones, having experienced the fact that stokers do occasionally neglect to unseal the Dip after charging the retort, thereby causing a waste or loss.

I feel that it is quite unnecessary for me to say more on the subject, excepting that, having had ten of Messrs. Chandler's Dip-Pipes in use more than one year, and having experienced the great benefits derived thereby, inasmuch as the yield of gas from the coal is greatly increased, and the retorts perfectly free from carbon and other advantages, and seeing that the same Dip has been made perfectly self-acting by the second patent, I feel convinced that this is the right thing.—Yours obediently,

W. CRICKMAY, Resident Engineer.

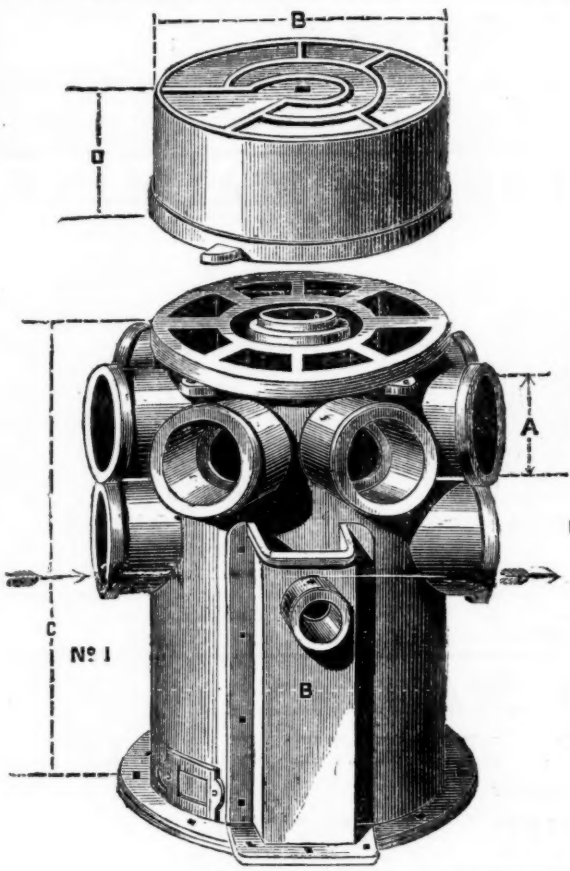
For terms of use and cost, apply to Mr. G. W. STEVENSON,

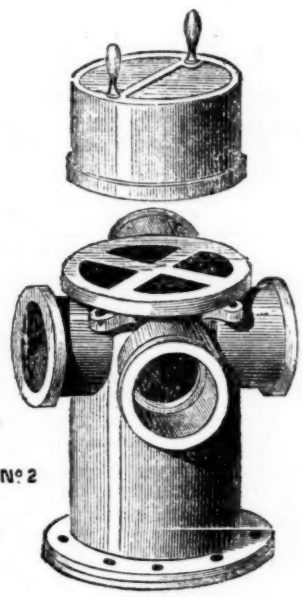
19, GREAT GEORGE STREET, WESTMINSTER.

MESSRS. NEWTON, CHAMBERS, & CO.,

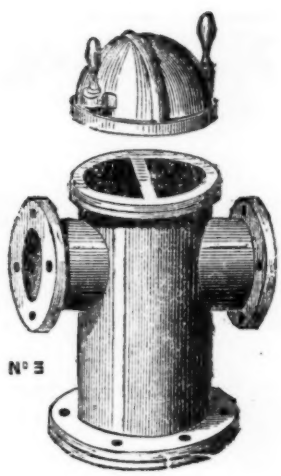
THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

IMPROVED CENTRE-VALVES.





THORNCLIFFE
IMPROVED BYE-PASS VALVE.
SIZES FROM 3 INS. UPWARDS.



THORNCLIFFE
IMPROVED STOP-VALVE.
SIZES FROM 3 INS. UPWARDS.

Sizes of the THORNCLIFFE IMPROVED CENTRE-VALVE.

	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A. Bore of Pipe. . .	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 ..	12
B. Diameter of Body.	16 ..	20 ..	23 ..	26 ..	28 ..	31 ..	34 ..	40
C. Height of Tank .	33 ..	35 ..	38 ..	43 ..	46 ..	48 ..	51 ..	56
D. Depth of Cover .	8 ..	9 ..	10 ..	11 ..	12 ..	13 ..	14 ..	16
Total Height . .	44 ..	44 ..	48 ..	54 ..	58 ..	61 ..	65 ..	72

In all cases the Covers are cast heavy enough to resist any required pressure.

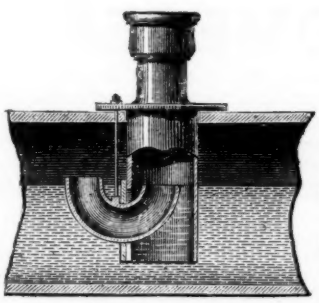
The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

N., C., and Co. also Manufacture and Erect

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.



DIP-PIPE, No. 1.

Messrs. N., C., and Co. are also the Sole Agents for

HAWKINS' PATENT SELF-ACTING HYDRAULIC DIP-PIPES.

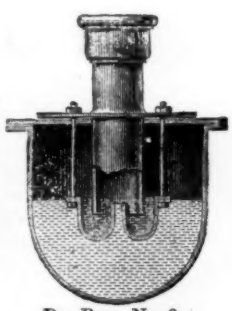
By their use the whole of the pressure caused by the Seal in the Hydraulic Main is entirely avoided, thus securing the many advantages long sought for.

Over 50 Gas Companies have already been supplied with them, many of which have been using them throughout their entire works continuously for over two years.

They can be applied to existing Hydraulic Dips, and at a very small cost.

They seal themselves in the same manner as the ordinary dip-pipes, therefore they are not likely to get out of repair.

By the aid of the adjusting screws they can be made to work on the old principle at pleasure.



DIP-PIPE, No. 2.

FOR PRICES, TESTIMONIALS, &c., APPLY TO

Messrs. NEWTON, CHAMBERS, & CO., Thorncliffe Iron-Works, near Sheffield, Sole Agents;

OR TO THE PATENTEE,

J. G. HAWKINS, NEEPSEND GAS-WORKS, SHEFFIELD.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

(Successors to JOHN WILLIAM O'NEILL & CO.,)

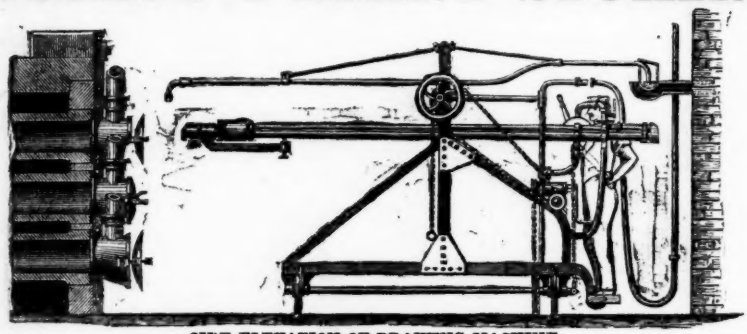
Offices—PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.,

CONTRACTORS FOR GAS PURIFICATION BY OXIDE OF IRON.

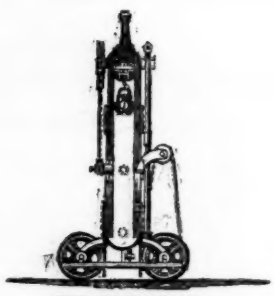
The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

JOHN WILLIAM O'NEILL, SAMUEL H. JOHNSON, } Joint Managing Directors.

FOULIS'S PATENT STOKING MACHINE.



SIDE ELEVATION OF DRAWING MACHINE.



END ELEVATION.

(The Charging Machine will be Illustrated in next week's Advertisement.)

Makers: TANGYE BROTHERS and HOLMAN, London and Birmingham; ADAM WOODWARD and SON, Manchester; ROBERT LAIDLAW and SON, Glasgow; MASCHINENBAU-ACTIEN-GESELLSCHAFT HUMBOLDT, Kalk bei Deutz; Or all particulars may be had from JAMES WOTHERSPOON, 31, St. Vincent Place, Glasgow.

ALDER AND MACKAY,

GRANGE WORKS, EDINBURGH,

MANUFACTURERS OF

CONSUMERS IMPROVED GAS-METERS;

IMPROVED DRY GAS-METERS, in Cast-Iron and Tin Cases,

OF THE HIGHEST EXCELLENCE,

Warranted to measure correctly, and not to vary.

STATION METERS AND GOVERNORS,

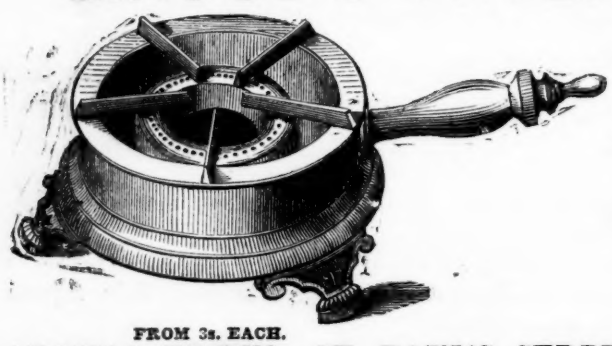
EXPERIMENTAL METERS, PHOTOMETERS, GASHOLDERS, &c.

PRIZE MEDALS—1862, 1867, 1871, 1874.

SIDNEY LEONI AND CO.,

SOLE LICENSEES AND AGENTS FOR GREAT BRITAIN FOR

GIROUD'S PATENT RHEOMETER.



FROM 3s. EACH.

This Instrument is easily fixed under any Burner; it regulates the volume of Gas to be consumed, notwithstanding the Size of the Burner or the Variation of Pressure.

Full particulars on application, also Pamphlets on the "ADVANTAGES OF COOKING AND HEATING BY GAS." With Illustrations, &c., of the latest and most improved

GAS KITCHENERS, GRILLERS, COOKING STOVES, REGISTERED BOILING STOVES (See Margin); also the NEW SAFETY PATENT TUBULAR GAS BOILERS.

LIBERAL TERMS TO THE TRADE.

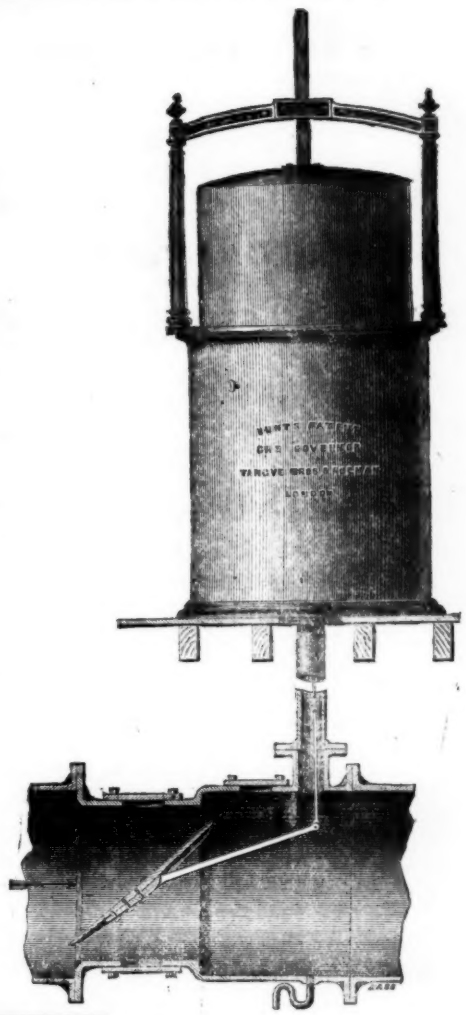
ADAMAS WORKS, ST. PAUL'S STREET, NEW NORTH ROAD, LONDON, N.

TANGYE BROTHERS AND HOLMAN,

LAURENCE POUNTNEY LANE, LONDON, E.C.,

SOLE MAKERS OF

HUNT'S PATENT EQUILIBRIUM GAS GOVERNOR.



In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown at C on the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at any convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by several leading Gas Companies, among whom are the following:—

The Gaslight Co.—two 36 in. at Blackfriars.
" " a 36 in. at Goswell Road.
" " a 24 in. at "
" " a 24 in. at Whitechapel.
" " an 18 in. at Bow Common.
" " a 24 in. at Beckton.
" " a 6 in. at "
The London Gas Co.—a 24 in. at Nine Elms.
" " an 18 in. at "
" " an 8 in. at "
The Exeter Gas-Works—a 24 in.
" Abergavenny Gas-Works—a 10 in.
" Birmingham Gaslight Co.—an 8 in.
" Monmouth Gas-Works—an 8 in.
" Devonport Gas-Works—an 8 in.
" Cannes Gas-Works—an 8 in.
" Mentone Gas-Works—an 8 in.
" Rochdale Gas-Works—a 4 in.
" Imperial Gas Co., a 12 in at Great Cambridge Street.

TESTIMONIAL.

The Gaslight and Coke Company, 9, Water Street, New Bridge Street, Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

Yours truly,

(Signed) JOHN JOHNSON.

VIENNA EXHIBITION, 1873.—The highest prize and only Medal "for Progress" for Direct-Acting Steam Pumps for general purposes was awarded to TANGYE BROTHERS AND HOLMAN, Engineers, London, for

THE "SPECIAL" DIRECT-ACTING STEAM PUMPS.

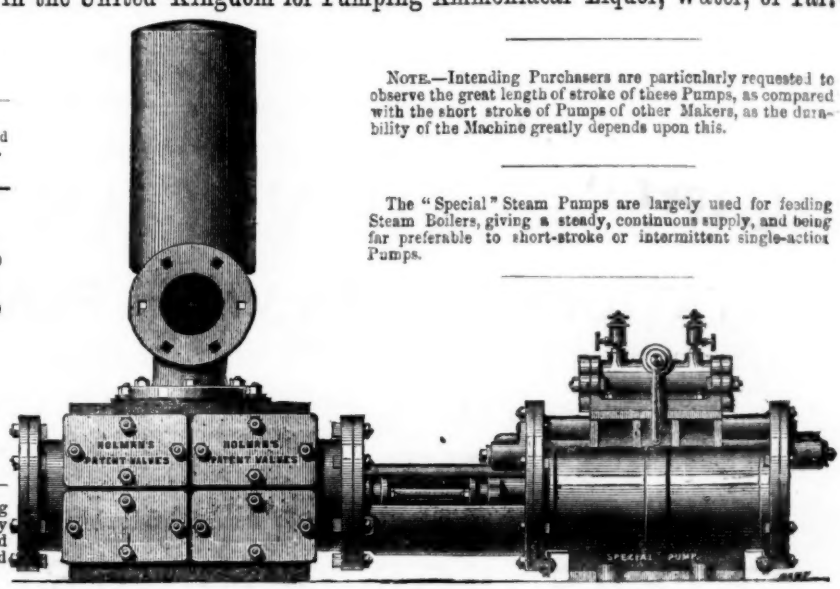
Upwards of 12,000 have been sold in England and America.

In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

The following are a few of the leading Sizes:—

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4*	2	9	815	18
3	3	9	1,830	18
5*	3	12	1,830	22 10
4	4	12	3,250	25
6*	4	12	3,250	30
5	5	12	5,070	32 10
7*	5	12	5,070	40
6	6	12	7,330	40
8*	6	12	7,330	50
7	7	12	9,750	50
10*	7	12	9,750	65
8	8	18	13,000	65
10	9	18	16,500	80
10	10	24	20,000	100
12	12	24	30,000	140

* These sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance piece between steam and pump cylinder at a small extra cost.



NOTE.—Intending Purchasers are particularly requested to observe the great length of stroke of these Pumps, as compared with the short stroke of Pumps of other Makers, as the durability of the Machine greatly depends upon this.

The "Special" Steam Pumps are largely used for feeding Steam Boilers, giving a steady, continuous supply, and being far preferable to short-stroke or intermittent single-action Pumps.

London 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

WILLIAM PARKINSON & CO.,

(SUCCESSORS TO SAMUEL CROSLEY,)

COTTAGE LANE, CITY ROAD, LONDON, E.C.

Established 1816.

MANUFACTURERS OF PATENT

WET & DRY GAS-METERS,

STATION-METERS WITH PLANED JOINTS,

GOVERNORS, PRESSURE REGISTERS, GAUGES,

AND EXPERIMENTAL APPARATUS,

STREET-LAMP METERS,

AND REGULATORS FOR AVERAGE METER INDICATION.

METERS FOR MEASURING WATER.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

G. W., Paddington.—*For want of space, your communication is reserved till next week.*

W. S., Ripon.—*The report does not possess sufficient public interest to warrant its insertion.*

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 10, 1875.

Circular to Gas Companies.

The Metropolis Gas Companies (Regulations) Bill has been withdrawn for the present session, and Sir James W. Hogg failed to obtain the opportunity of pronouncing an eulogium on the, at present, defunct measure, and the select committee who considered it. We cannot, however, pretend to shut our eyes to the fact, that the resurrection of the Bill will happen next year, and therefore the gas companies must be prepared for a renewal of the struggle which has taken place in the now expiring session. It is true that the Bill which has so far failed is not exactly the measure promoted by the Metropolitan Board and Corporation of London. The original Bill was intended to effect a partial confiscation of the larger companies, by compelling them to supply gas at a price which could not yield them full dividends. But the injustice of the proposed measure was so apparent, that the Government stepped in and declared that unless the most important clause in the Bill was modified, they would not consent to its further progress. Thereupon, as our readers know, an upward as well as a downward scale of dividend was adopted at the suggestion of the Board of Trade, which might prove advantageous to some of the smaller, but which cannot be accepted as satisfactory or even just to the larger companies. For this reason alone the strife must be renewed next year, unless in the meantime some compromise be arrived at. Mr. Newton, who at the last meeting of the Metropolitan Board, as chairman of the Parliamentary Committee, brought up a report on the parliamentary proceedings of the session, apparently expects that the leading companies will presently go to the Board on bended knees and humbly make their submission. We can assure him that nothing of the sort will happen. If the Commercial Company's Act be taken as the type for future metropolitan gas legislation, the resistance must be prolonged. The Chartered, the Imperial, and the Phœnix Companies will never commit suicide. They may be again attacked, and, it may be, worsted in the fight; but accept this measure of the Metropolitan Board they never will. If, then, the "amicable settlement" of the dispute, which Mr. Newton pretends to hope for, is to be come to, the Metropolitan Board must make concessions. We have repeatedly urged that general legislation like that proposed this year, must be eminently unjust to some companies, each of whom should be legislated for upon their particular conditions. Give us a range of price like that awarded by the Act of 1860, and all will be satisfied; but a maximum of 3s. 9d. for all alike will never do.

We are sorry that we have not yet received the report of the Parliamentary Committee of the Metropolitan Board, referred to above, and that we cannot find space for the clever speech of Mr. Newton. The latter was, of course, eulogistic as regarded all concerned on the part of the Board. To the legal advocates of the Board Mr. Newton gives praise for assiduity, which certainly was well deserved; but we never before heard either Mr. Cripps or Mr. Philbrick accused of being eloquent or powerful. Their merit as advocates lies in another direction. So, too, the chairman is praised for simply doing his duty as a representative of the people, and for performing works of supererogation, so far as this Bill was concerned. It was perfectly unnecessary for Sir James Hogg to stay in the House of Commons until two in the morning, in order to forward this Bill. Mr. Newton is modestly silent as to his own exertions. He may be content with the appreciative cheers of many of his colleagues on the Board, and the satisfaction of some of his constituents; but let us hope that he will obtain a more substantial recognition of the value of his services from some quarter or another.

Mr. Newton admits that the proceedings of the Metropolitan Board have been costly—how costly probably we shall never know. Counsels fees are only a part of the expense of promoting Bills in Parliament. The costs of the companies have also been large, and both will have to be paid by the same parties—the ratepayers, who are mostly gas consumers.

We will not venture to-day to speculate on the future. It has been said above that the Act adopted by the Commercial Company cannot possibly be accepted by the "leading" companies. We notice that a belief is entertained in some quarters that provisions agreed to by one company may be enforced on the others, and that the only alternative is acquiescence, or the sale of the undertakings to the Metropolitan Board. Now, we are firmly of opinion that a Bill like that just withdrawn may be safely resisted; and we further believe that Parliament will never entrust the gas undertakings to the Metropolitan Board, as at present constituted. At the present moment, however, it would appear that the gas dispute will be thrown into the shade by the water question, and we may be confident that neither Parliament nor the Metropolitan Board will be able to deal with both in one year.

Mr. James Beal has addressed to us a good-humoured letter—to be found in another column—which deserves a few words of notice. Among the hybrid measures proposed this year, there was a Bill, the object of which was to amalgamate all the metropolitan gas companies into one, with a view to a transfer to some municipal body, or, waiting the constitution of such municipal body, to place the undertakings under the control of a body of commissioners. Rightly or wrongly, we considered the proposal to emanate from the Metropolitan Municipal Association, and hence the remark made last week. We knew, of course, that the transference of the undertakings to the control of three commissioners was only intended to be a provisional measure, purchase by the municipal authority being the ultimate object. If Mr. Beal disclaims any connexion with the Bill we referred to (vol. xxiv., p. 693), there is an end of the matter. On the other hand, if the Bill was promoted by the Metropolitan Municipal Association, we are heartily allied with Mr. Beal. We are entirely with him in his endeavours to obtain what Lord Camperdown terms a "tolerable" form of Government for the metropolis. In the next place, if the gas undertakings are to be purchased by some municipal body, they can only be obtained on some such terms as were proposed in the Bill we refer to, and are mentioned in the letter we publish to-day. As a transitory measure, we have no great objection to see them handed over to a "body of commissioners;" but we believe that the amalgamated companies would be better managed by a select number of present directors, who have had much experience in the work, and have great interests at stake.

The "Ninth Annual Report of the Metropolitan Municipal "Association for Promoting the Establishment of a London "Municipality," which Mr. Beal has forwarded to us, is really an interesting document, though little more than a compilation from the London newspapers. It abounds with egotisms; but that is not to be wondered at. There never was a great reformer who was not egotistical, and Mr. Beal is no exception. He seems, however, hardly conscious of the fact that his work is only just beginning. His assaults on vestrydom have, as yet, been powerless, just as cannon-balls are wasted on mud fortifications. A

"public," in place of a "parochial," opinion has yet to be created in the metropolis, and to the development of this Mr. Beal should devote his efforts. Moreover, when he next promotes a Bill, we hope he will secure a statesman as the putative father of the measure. We might write much more on this matter, but general politics are beyond our scope. On a future occasion, however, we shall return to this report, and notice a few matters which are of interest to our metropolitan readers.

We are happy to see that there is a growing opinion in Manchester that the gas consumers of that city are an overtaxed class. Our readers have been informed that by a resolution of the Town Council, the Gas Committee are compelled to hand over to the Improvement Committee 10 per cent. on the capital employed in the undertaking, whether the profit has been made or not. This profit has not been made for some years past, and the "suspense account," as it is called—that is, the deficiency for which the Gas Committee are responsible, and which the gas consumers will have to make up—now amounts to the respectable sum of £53,000. The deficit will, of course, stand in the way of any reduction of the price of gas in Manchester for two or three years to come. An endeavour was made by a councillor last week to get the resolution, above referred to, rescinded. He was at once met with the objection, that his object was "to stop "the great improvement now taking place in Manchester;" and another alderman volunteered the information that "the whole "of modern Manchester had been raised out of money borrowed "on the security of the gas profits." The gas consumers of Manchester are a much-enduring class, but they are beginning to kick, and we have little doubt that in the course of a year or two they will get their gas supply on proper principles. At the present time the consumers in Manchester are simply plundered, and their case may serve as a warning to the corresponding class in the metropolis. The day of purchase will, no doubt, come, and may come quickly; but whenever it does arrive, we advise the London consumer to take care that he is charged for gas, and gas only.

The newly appointed Gas Committee of the Corporation of Birmingham have naturally—we might almost say necessarily—chosen the mayor for their chairman. Alderman Chamberlain will find his post, for a time, anything but an easy one. He has to organize his department, he has to smooth down the opposition of some of the outlying Local Boards, who have been grievously irritated by his recently delivered speech. And presently he will have to face the gas consumers of Birmingham, who will have the wit to see that if there be that "substantial "reduction of taxation" which the mayor anticipates, they must suffer, since the burden removed from the general ratepayer must be put on the shoulders of the gas consumers. If the consumers of Birmingham are wise they will at once take steps to prevent their Corporation from following the course pursued in Manchester.

The Maidstone Gas Company, having settled satisfactorily the dispute about the illuminating power of their gas, have called in Mr. R. P. Spice to report on the financial relations of the company with the consumer. The report has been published, but we have no space for it to-day. In shows that the company have been in the habit of charging to revenue what ought properly to have been charged to capital account. This was done with the very best intentions, but, in our opinion, it was wrong. Surplus profits should go in reduction of price, and the capital account should be added to as required. In this case, although the course pursued by the directors has been adverse to the interests of the proprietary and favourable to the consumer, it has failed to satisfy the latter class, who would have duly appreciated a reduction of 1d. per 1000 feet. Statutory gas undertakings, we may repeat, are most satisfactorily managed on strictly legal principles. Apply surplus profits to a reduction of price, and add to capital as may be necessary.

No gas company in England more faithfully fulfil their obligations than the British Gaslight Company; their success, however, only excites the cupidity of Corporations. The Corporation of Hull have been for some time anxious to get hold of the undertaking of the company in that city, and now the Hanley Town Council are moving to effect the purchase of the Hanley undertaking. The company are naturally indisposed to sell, but the Town Council are taking up the matter with a high hand, and are talking of making a compulsory purchase.

WISBECH GAS COMPANY.—The annual meeting was held on the 29th ult. The report recommended a dividend of £10 per cent. The chairman (Mr. George Dawbarn) moved the adoption of the report, which was seconded by Mr. H. Dawbarn and agreed to. The chairman said with reference to the resolution about to be read, it must be either accepted by the meeting or rejected. According to the Act of Parliament, no amendment could be moved upon it. The effect of the resolution was to reduce the price of gas 6d. per 1000, and bring it down to 4s. 10d. net. He proposed the resolution, which, after Mr. Richard Dawbarn had seconded it, was passed unanimously.

Water and Sanitary Notes.

THERE are many evidences that the water supply of the metropolis will occupy much public attention between this time and the next meeting of Parliament. We have also reason to believe that in official quarters the present position of the water supply is deemed to be of much more importance than the gas supply. The prospect of a general rise in water-rates, according to the assessments, which will come into force next April, has greatly alarmed the public, who have, in very many cases, seen their water-rates more than doubled within the last few years. Under these circumstances, the water companies may put a stop to much unpleasant agitation, if they will fairly state their intentions in view of the new assessments. The legal right of the companies to charge according to the assessment is indisputable. But the policy of raising the rates, when the tendency to-day is towards a reduction in consumption, is open to question. Lord Camperdown's intention seems clear. He will next year introduce a Bill to tie down the companies to the assessments of 1871. We know very well that the companies have not availed themselves of the advantages of that assessment to anything like the legal extent. The advanced rates have not been universally made, nor have the advances, when made, been in an equal ratio to the increased assessments. These facts are not known to the general public, and therefore we wish to have them fully set forth by the companies. A concise statement from them would do much to allay public irritation.

We shall not be at all surprised to see the Metropolitan Board of Works and the Corporation of London jointly promoting, next year, a Bill for the purchase of the water undertakings. Parliament, we are certain, will never pass a Bill of the kind, until London has a "tolerable" form of government; but the action of the local authorities would put the companies to great expense, and, to prevent that, we desire that the companies should take the metropolitan public into their confidence and state their intentions, in view of the new assessment.

The Birmingham Water Committee have elected Mr. Alderman Avery as their chairman. No better selection could possibly have been made. We have not, among the members of our London local authorities, any men comparable with the Mayor of Birmingham and Mr. Alderman Avery. If we had, our public authorities would hold a different position in public estimation. Mr. Avery is a retired manufacturer, of considerable wealth, who devotes what might have been his well-earned leisure, but which now is, perhaps, the busiest time of his life, to the sanitary improvement of the borough of Birmingham. It has been under his auspices, as chairman of the Sewage Committee, that the great sewage works, now approaching completion, have been carried out; and a complete system for the removal of nightsoil and town refuse has been inaugurated. If energy and honesty of purpose can make the water-works a success in the hands of the Corporation, that success is assured by the appointment of Mr. Alderman Avery.

Sewage, it is hardly necessary to say, continues to be the great difficulty of the day. The Town Council of Barnsley are now threatened with the sequestration of the borough rates, in consequence of their neglect to adopt some plan for the diversion of their sewage from the river Dearne. They have obtained an extension of time to Nov. 10; but it will be quite impossible for them to have works completed by that date.

The Town Council of Leeds are giving the Native Guano Company full opportunities for proving the value of their process. As regards the effluent water, it seems to be agreed that, while it might, by some additional outlay for materials, be improved, it is now, in a certain sense, satisfactory. The manure, too, is having a fair trial. The Town Council have tried it on a farm of their own, with good results, and now they have given a quantity to farmers, whose reports at the end of the season are anxiously looked for. The A. B. C. manure has been sold for £3 10s. per ton ever since we first heard of it; but if the Corporation of Leeds can get as much as £1 per ton, the revenue will go a long way towards meeting the expenditure on the treatment of the sewage.

Speaking of Leeds reminds us to note that the Corporation have recently paid their annual visit to the water-works. We have no space for any account of the new works, now approaching completion, which will, according to Mr. Hawksley, be sufficient for the supply of Leeds for the next century, if the Corporation will only take proper precautions to prevent the waste of water. The Marquis of Salisbury, in reply to Lord Camperdown, suggested a justification for the advanced rates of the London water companies, which was, increased outlay on the part of the companies. On this point we may quote the following from a speech made by Mr. Hawksley on the occasion we refer to. He said that "some two years ago he was called upon to make an exact "duplicate of works he had made in 1850, consisting of pumping

"power, reservoirs, main laying, &c. On both occasions the work "was done by contract, the lowest tenders being accepted, and "yet in the later case the lowest tenders were double the price at "which the works were executed in 1850." This is, no doubt, the experience of the metropolitan companies, who have been engaged on extensions within the last few years, and every candid person will admit that this increased outlay must necessitate an advanced water-rate.

Colonel Beresford's Water Bill has disappeared from the notice paper without remark. Its reintroduction may be expected next session, with alterations to meet the demands of the recent agitation.

Correspondence.

METROPOLIS GAS LEGISLATION.

SIR,—In your leader of this date, commenting on the evidence of Mr. Reilly, you facetiously remark that "the arrangement suggested by Mr. Reilly looks very like that proposed by Mr. Beal and his party, who want to see the gas undertakings managed by three commissioners."

Permit me to state that you do me an injustice. Charles Lamb thought Coleridge was always poking fun. I shall begin to think that you, too, have your funny side. My policy (if I may elevate the part I have taken in gas legislation to a policy) was, in the movement closing with the Metropolis Gas Act, 1860—to establish control over an otherwise unregulated monopoly. I then stated that my next object was to secure the absorption of the companies by a municipality, and to that end I advocated amalgamation. I succeeded in obtaining assent to the principle in the Act of 1868. Control first, amalgamation second, with a view to a third move—purchase; and my next object is the purchase by the municipal authority of the undertakings. Hence I was in opposition to the Board this year, so far as two out of their three bills were concerned.

I think the time has come when the question of purchase should be faced. If by amalgamation the companies, on their own action, were reduced to one or two—one north and one south of the Thames—then the body representing London could invite the representatives of the companies to a morning sitting, discuss and, if wise, settle terms, and those terms might be the exchange, for so much municipal stock (surely, a first-class security), so much gas stock, without disturbing the money market or the exchange of a sovereign.

It is my misfortune to live under a municipal *régime*, headed by Colonel Hogg and Lord Mayor Stone. I cannot expect the bodies they represent to learn the lesson of the inquiries from 1857 to now, because they will not study them; but I can pursue my own course, and point to *my policy* as the right one in the end. If the corporation and board are wise, they will adopt it, and next year promote one bill, with a few clauses, having two objects, one compulsory amalgamation, the other compulsory purchase—say, within five years, by which time I hope to have established (what does not now exist) a government for London. This is my policy. To this I have devoted great labour, and have endured much obloquy. I am intent on this work, and, health and strength being given me, I hope to succeed.

I am satisfied with the result of the legislation which has proceeded on my lines (and I send you, for comment, our Metropolitan Municipal Association report), notably in the case of the Acts of 1860 and 1868, which you will find set out, showing results gratifying to any one who is content, as the result of his labours, in saving £1,000,000 per annum to his fellow-citizens in London. In the work, as proposed by me, I think you should be my ally, and that you should not interpose good-natured jokes of the style of "Mr. Beal suggesting three commissioners" to do a great work, which I yet hope to see entrusted to a great municipality, elected by the citizens of an enlarged, and elevated, and popular constituency of the whole people of London.

Aug. 3, 1875. JAMES BEAL.

MALAM'S PROCESS OF GAS-MAKING.

SIR,—I very much regret that, being in France on urgent business connected with my patented process of gas-making, I was unable to be present at the meeting of the North British Association of Gas Managers recently held in Dundee, at which Mr. Smith, of Aberdeen, read a short paper on "Malam's Process of Gas-Making," which is, in substance, a reproduction of his report to the Corporation of Aberdeen, made in April last, and reported in your JOURNAL. There is, however, an important omission in the paper just read—a part of his report unrepeated, and all reference thereto carefully avoided. I refer to the portion which dealt with his laboratory test of a sample of the coal experimented with when here. The omission which Mr. Smith makes I will oblige him by supplying; for, whilst I am desirous of concealing nothing, I must protest, in the name of common fairness, against the withholding by Mr. Smith of any part of the truth. In the paper just read, he says, shortly, "from a sample of the same coals I found that by the ordinary system they produced 9488 cubic feet per ton, of 26·49 candles."

Now he carefully avoids reference to the manner of conducting the test whereby he arrived at this result, but the following extract from his report will be explanatory:—

"The coals experimented on appeared to be a mixture of Drumpark and Auchlochan, four tons of which were carefully weighed and carbonized, yielding 37,500 cubic feet of gas as measured by the station-meter, being on an average of 9375 cubic feet per ton, of an illuminating power of 26·49 candles. In order to satisfy myself as to the quality of the coals, I had a sample sent to Aberdeen, and ascertained from trials in my experimental gas apparatus that they produced (after deducting 5 per cent.) 9488 cubic feet per ton, of an illuminating power of 26·29 candles, which should be obtained in actual practice on a large sale."

As I pointed out in the JOURNAL of the 20th of April, "surely Mr. Smith ought to know that testing small quantities of coal in a laboratory experiment is a very different affair from testing the same coal in actual practice on a working scale, and that no one knowing anything of the subject would ever think of merely allowing 5 per cent. as a difference of calculation; the per centage allowed in calculating the gas yield of coal in laboratory experiments by the highest authorities in the land varies at from 10 to 20 per cent. But what does this prove? Why, it simply proves this, that had Mr. Smith made his calculations on a correct basis, even allowing the difference at only 15 per cent., instead of the unheard-of and incorrect difference of 5 per cent., the yield of gas would be 9375 cubic feet per ton, as against the result of his test by the ordinary method of 8551, being a difference of nearly 1000 feet in favour of my process, and this without any diminution in illuminating power."

The test made by Mr. Smith at Dumfries was not a fair test. It was an experiment conducted under very disadvantageous circumstances, rendering the maintenance of the required heats an impossibility, and hence the small yield of gas obtained, and the richness of the resulting tar in those hydrocarbons from which the largely increased yield of gas is by my process obtained when that process is wrought as it should be. I leave the scientific world to judge whether an experiment, the given results of which are so much at variance with physical laws, is to be taken as a correct test. The discussion which followed the reading of the paper was chiefly in the direction of expressed doubt, and positive condemnation of the reliability of Mr. Smith's experiment as a correct test of the value of the process, and I would willingly have left your readers to form their own opinions respecting the merits of the said discussion, but a statement made by Mr. M'Crae calls for more than passing notice, as being unwarranted and unfounded in fact. According to the report, Mr. M'Crae appears to have said, in answer to the remarks of Mr. Nelson: "He has come down to 1500 or 2000 (feet), and has revealed to us what should have been revealed at the outset, *and what I knew*, that Mr. Malam's works were in a very dilapidated condition."

I am not aware that Mr. M'Crae has had any opportunity of forming, from personal observation, an opinion as to the condition of the Dumfries Gas-Works, except on one occasion, when he made a careful survey of the said works on behalf of the Town Council of Dumfries, with a view to fixing their value as a guide to a then contemplated purchase of the works by the corporation. I have before me a copy of his report, dated April 11, 1872, and under the heading of "General Description" I find the following:—"The Dumfries Gas-Works are good, substantial, well kept," &c., &c. This is the written opinion of Mr. M'Crae, formed on his last, and I believe only visit to "Mr. Malam's works;" and how he can reconcile this with his statements at the Dundee meeting, I leave it to his ingenuity to devise.

A. MALAM.

Dumfries, Aug. 5, 1875.

HALIFAX (CORPORATION) GAS-WORKS.

MR. HAWKSLEY'S REPORT TO THE GAS COMMITTEE.

SIR,—In the JOURNAL of the 20th ult. you published a report made by Mr. Hawksley to the Gas Committee of the Town Council of Halifax upon the condition of the corporation gas-works. Upon that report I propose to make a few observations.

There is no denying the fact that the invested capital in the Halifax Gas-Works is too large for the business now being transacted, and the fact ought to be admitted honestly and candidly, and the true explanation given—an explanation which must be satisfactory to every one. Instead, however, of adopting this course, Mr. Hawksley has sought to justify and explain away the exaggerated capital by showing, not what the business of the undertaking now is, but what it is capable of becoming, and by applying the present invested capital to a future business. The explanation of the fact of the exaggerated capital lies in a statement of the history of the undertaking.

The corporation have not always been the possessors of the gas-works. In 1856 they bought the undertaking from a private company, and paid £37,500 for the land upon which the works stood, and for the goodwill of the concern. Not a single stone (except a foreman's residence), or pipe, or particle of apparatus, that was transferred by the company to the corporation, now exists upon those works. Everything was in ruins, and the distributing apparatus was in such a state of disrepair and insufficiency, that the unaccounted-for gas amounted to nearly one-third of the total quantity manufactured. Under the instructions of the Gas Committee of that day, I re-piped the whole of the district, and reconstructed the works; utilizing the "somewhat contracted and highly-inclined site," as Mr. Hawksley terms it, so as to secure a "remarkable advantage" in the receipt of coals and the delivery of coke.

Now if the £37,500 be deducted from the present investment, the capital would stand at £192,500, and as 220 million feet were sold last year, it would represent a capital of £875 for every million feet sold, which is still too large, and larger than the average throughout the country, but which is further explained by the purchase of the Salterhebble and the Stoney Royd sites for supplementary works, the construction of the branch railway, and other things. As matters now are, the capital invested is £1045 per million feet sold, a capital larger than that of any, and nearly double that of some, of the metropolitan gas companies.

When a concern starts, as did the Halifax Corporation gas undertaking, 19 years ago, with a dead weight of nearly £40,000, it needs that a long period should pass over before the proportion of capital to the amount of business transacted attains its true relation. When I ceased to be actively concerned for the Gas Committee, in 1862, the sale of gas was 87 million feet, and the capital £110,000, or £1265 per million feet of gas sold. At that time the new works and distributing apparatus were completed; and I think that in the 13 years which have elapsed since then, the proportion of capital has been fairly reduced in regard to the business transacted.

Committees of corporations are wonderfully painstaking and diligent in the fulfilment of their duties, and now that the attention of the Halifax committee has been directed to this special matter of the relation of capital to business, I doubt not they will in the future watch it with great advantage to the undertaking and to the public.

Mr. Hawksley approves everything on the works, "with trivial exceptions." I hope the committee will consider them so trivial as to exclude them from their consideration. The first exception is that the roof of the purifying-house is of wood, and ought to be of iron. Does Mr. Hawksley think it will take fire, or did he omit to look at the roofs of the retort-houses, which are constructed in a precisely similar manner, and which he does not recommend to be taken off and replaced with iron? Mr. Hawksley's practice is to build purifying-houses with iron roofs, and he thinks ill of the practice of those who differ from him. I remember when he placed his faith exclusively in iron retorts; and as to clay retorts, he "would none of them." But they did answer in spite of Mr. Hawksley, and he was converted on the same principle that

the sheep in Tom Hood's "Ode to Rae Wilson" was—"conciliated." Now, this wooden roof (not half so wooden, by-the-by, as Mr. Hawksley's recommendation, for the ties, struts, and shoes are iron) has lasted about 18 years, and is probably as good for all practical purposes as the day it was erected; and I want to know what it has done amiss that it should not remain where it is, and serve its useful purpose for another 18 years?

The next "trivial exception" which Mr. Hawksley makes to his otherwise unqualified approval of the works is, that there are certain openings between the purifying-house and the boiler and exhauster houses, and he thinks they ought to be closed for fear of an explosion; and he intimates that explosions in purifying-houses are of frequent occurrence. The fact is that the boiler-house is separated from the purifying-house by the whole width of the exhauster-house, and that the only opening, communicating between the purifying-house and any other covered building, is an opening into the room where the tar and liquor pumps are placed. The arrangement has worked well and without accident for 18 years; and as to the frequency of explosions in purifying-houses, I would only say that not one has ever occurred in my experience, and, in fact, I have never even heard of one.

The third and only remaining "trivial exception" is, that "there is no apparatus *in use* whereby the illuminating power and purity of the gas can be satisfactorily determined or the pressure at which it is delivered be properly recorded. The italics are mine, for, without them, the allegation would be incorrect—that is, if things are now as they were in my time. There was then a complete photometric apparatus and sulphuretted hydrogen test, and a self-registering pressure cylinder on the outlet from the governor. If these things are not "in use," the manager can put them into use at a day's notice; and to occupy a quarter of a page of a report in commenting upon them, when a single sentence addressed to the manager would have set matters right, is not at all "trivial," but a sheer waste of time, and an abuse of the instruction to report.

Mr. Hawksley recommends further expenditure. The present largest daily sale of gas is 1,500,000 feet, the gasholder storeage being 1,628,000 feet. Mr. Hawksley states that this capacity of storeage is sufficient for a daily sale of 2,000,000 feet, yet he recommends that the committee should now proceed with the erection of another gasholder, *because* a "gasholder of competent size cannot be erected in less than two years." A gasholder with its tank and all appendages, of half a million to a million feet capacity, may be erected in considerably less than 12 months after the instructions have been issued for it; but, setting that aside, the consumption of gas in Halifax during the last 10 years has increased at the rate of less than 8 per cent. in the compound ratio, and as it was a million and a half per diem in 1874, it follows that the two millions, which Mr. Hawksley says the present storeage is equivalent to, will not be reached until 1878. If, therefore, the committee set about constructing another tank and holder in 1877, they will keep pace with the wants of their district, and economize the expenditure of capital.

Mr. Hawksley states that in "*reputedly*" (again the italics are mine) "well-constructed concerns, the average amount of unaccounted-for gas is 15 to 16 per cent." Why does Mr. Hawksley persist in reiterating the dogmas of 20 to 30 years ago? He knows perfectly well that there are companies who sell and get the money for a greater number of feet of gas for every ton of coal carbonized than the Halifax Corporation make. The difference between make and sale is unaccounted for, and is a dead loss; and when I inform you that last year there was lost in distribution at Halifax 28 million feet of gas out of a total make of 247 millions, it is apparent that Mr. Hawksley has been leading the committee into a fool's paradise, instead of showing them how they may readily diminish their expenditure and increase their profits.

The unaccounted-for gas at Halifax in the year 1866 was 6·46 per cent.; in 1867, 10·66 per cent.; in 1868, 8·43 per cent. I have not the intervening years, but in 1872 it was 10·00 per cent.; in 1873, 9·74 per cent.; and in 1874, 11·32 per cent.

There is no magic in 10 per cent., except it have respect to dividends; but 10 per cent. is nevertheless the standard which I say should never be exceeded in a gas undertaking, whether of good or bad repute; and if Mr. Hawksley had candidly drawn the attention of the committee to the fact that the quantity of gas lost by leakage has been increasing, and last year made a great jump upwards, and that at the present time the product of gas from nearly 3000 tons of coal is annually lost, he would have done the committee a vastly greater service than by slurring over a blot which, once brought under the notice of the committee, they would have set themselves to remove.

Halifax is built on a hill-side, and, in order to equalize the pressures throughout the district, I introduced, 18 years ago, street governors at every 50 feet of altitude, and cut down the pressure on the outlet from each governor. By so doing there was nowhere a pressure exceeding two inches, nor less than one inch; generally it was from an inch to an inch and a half. The main pipeage has been greatly extended since then, and I can only account for the large quantity of unaccounted-for gas by supposing that the system of "governing" the pressures has not kept pace with the lengthening of the mains, or possibly there are many worn-out services which need replacement. With an increasing consumption the ratio of gas unaccounted for should be a decreasing one. In Halifax it is an increasing ratio, and ought to be looked to.

There is only one other matter in Mr. Hawksley's report I wish to correct, and that is his assertion that "the working capital is commonly assessed at about one-third of a year's *income arising from the sale of gas*." Working capital is the amount which a manufacturer has to expend before he gets a return for his money. The working capital of an undertaking, in which the gas-rents are collected at four equal periods in the year, is, therefore (allowing one month for collection), *the sum expended* in the heaviest third of the year for coals, wages, and other outgoings, less the sum received by the sale of residuals. The Halifax manufacturers will understand this, if Mr. Hawksley does not.

I hope the committee will not be induced by Mr. Hawksley's representations to alter their practice in regard to setting aside, out of profits, a sum annually for depreciation. Notwithstanding all Mr. Hawksley may say to the contrary, he cannot make the life of a gas-work everlasting by repairs, any more than he can make an old coat into a new one by patching and mending. Ordinary repairs ought to be well done, and if well done, the evil day of entire renewal is indefinitely postponed; but eventually it comes, and the consequence of adopting Mr. Hawksley's advice would be that all renewals would have to be made out of capital. It is in this way that the investments of gas undertakings become exaggerated, for renewals ought always to be made out of profits, and not out of capital.

That Mr. Hawksley should mix up the sinking-fund, which the committee are compelled to lay aside for the repayment of borrowed moneys, with a depreciation-fund which is to provide for a renewal of plant purchased with those borrowed moneys, is all of a piece with the other parts of this report, and with his usual custom. By laying aside a depreciation-fund, the committee are wisely providing for the future, but by neglecting to do so, they would be living from hand to mouth, and whenever a worn-out piece of machinery required to be reinstated, they would have to borrow more money instead of having the funds in hand with which to do the work.

4, *Westminster Chambers, London, S.W.* G. W. Stevenson.

METERS TO PUBLIC LAMPS.

Sir,—Supposing the naphthaline difficulty not to be insurmountable, would not the costliness of my plan be more than balanced by the certainty of *all* the gas being measured by meters of "scientific accuracy," instead of 11-12ths of it being left to the uncertain action of "Regulators?" W. C.

Parliamentary Intelligence.

HOUSE OF LORDS.

Monday, Aug. 2, 1875.

The following bills received the Royal Assent, by Commission:—Gas and Water Orders Confirmation, Birmingham (Corporation) Gas, Birmingham (Corporation) Water, Oldham (Corporation) Water, South Staffordshire Water.

The Earl of Camperdown gave notice that, on a day to be named, he would call the attention of the House to the water supply of the metropolis.

CONSPIRACY AND PROTECTION OF PROPERTY BILL.

On the report of amendments in this bill,

The Earl of Rosebery moved, in clauses 4 and 5, to leave out the words "of service" after the word "contract," and stated that his object was to apply the clause which related to those employed by gas and water companies to employers, as well as to those under a contract of service. This amendment was necessary to make the clause in harmony with the general principle of the bill, which was to put employers and employed on the same footing in respect to contracts. It was difficult to see what objection there could be to the amendment, or why contracts of service should be treated differently from other contracts.

The Lord Chancellor said that a contract of service was different from other contracts, because a man could carry on a large business only through trusted hands, and the betrayal of the trust by the person employed might be attended with the most serious results to the employer. In other kinds of contract there was no position of trust. Again, in respect of those other kinds of trust, the world was open to the contracting parties; while, in the case of contracts of trust, the employer must fix on some particular person, and hand over to him the control, or the partial control, of his works.

Their lordships then divided on the amendment, when there appeared—

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Lord Penzance suggested the omission of the word "maliciously" in clause 5, and other clauses providing against offences under the Act.

The Lord Chancellor said that in the Malicious Injury to Property Act the word "maliciously" was used in analogous cases. In that Act, however, a clause was inserted which stated that the provisions of the statute were to apply, whether the injury had been inflicted out of malice against the owner of the property or otherwise. Before the third reading he would consider whether some such declaratory clause might not be inserted in this bill.

The report was then received.

Tuesday, Aug. 3.

The Stroud Water Bill was reported, on re-commitment, with amendments.

Thursday, Aug. 5.

CONSPIRACY AND PROTECTION OF PROPERTY BILL.

This bill was read the third time.

The Lord Chancellor then moved to insert, after clause 14, the following clause:—

"The word 'maliciously,' used in reference to any offence under this Act, shall be construed in the same manner as it is required by the 58th section of the Act relating to malicious injuries to property—that is to say, the Act of the session of the 24th and 25th years of the reign of her present Majesty, cap. 97, to be construed in reference to any offence under such last mentioned Act."

The clause was ordered to be inserted, and the bill, as amended, was passed.

The Duke of Northumberland gave notice that on an early day next session he would move that an humble address be presented to Her Majesty, praying that Her Majesty will be graciously pleased to appoint a Royal Commission to inquire into the working and management of works and manufactories smelting, burning, or converting ores and minerals, by which sulphurous acid, sulphuretted hydrogen, and ammoniacal or other gases are given off; to ascertain the effects produced thereby on the health of animal and vegetable life; and to report upon the best means to be adopted for the prevention of injury thereto arising from the exhalation of such acids and gases, and upon the legislative measures, if any, required for this purpose.

Friday, Aug. 6.

The Stroud Water Bill was read the third time, with the amendments, and passed.

The Commons amendments to the Barrow-in-Furness Corporation Bill were considered, and agreed to.

HOUSE OF COMMONS.

Monday, Aug. 2, 1875.

The Lords amendments to the Commercial Gas Bill were agreed to.

The Barrow-in-Furness Corporation Bill (Lords), as amended, was considered; amendments made. Bill to be read the third time.

Metropolis Gas Companies Bill.—The committee on this bill was deferred till Tuesday, Aug. 3.

METROPOLITAN WATER RATES.

Mr. Goldney gave notice that, early next session, he would ask for leave to bring in a bill to confine the operation of the Metropolis Valuation Acts to strictly public purposes, and to define and limit the taxing and rating powers claimed to be vested in the various water companies of the metropolis.

TUESDAY, AUG. 3.

METROPOLIS GAS COMPANIES BILL.—The committee on this bill was further deferred till Thursday, Aug. 5.

WEDNESDAY, AUG. 4.

A petition was presented from the Elgin Gaslight Company against the Burghs and Populous Places (Scotland) Gas Supply (No. 2) Bill.

THURSDAY, AUG. 5.

The Barrow-in-Furness Corporation Bill (Lords) was read the third time, and passed, with the amendments.

METROPOLIS GAS COMPANIES BILL.—The order for going into committee on this bill was read, and discharged. Bill withdrawn.

HOUSE OF LORDS COMMITTEE.

MONDAY, JULY 5.

(*Before Lord* PENRHYN, *Chairman; the Duke of* GRAFTON, *Lord* CASTLEMAINE, *Lord* RAGLAN, *and Earl* GREVILLE.)

BIRMINGHAM CORPORATION WATER BILL.

(*Concluded from page* 187.)

At the sitting of the committee this morning, a table was put in by Mr. *Heaton*, chairman of the water-works company, showing the dividends paid by them from 1855 to 1874, and the capital called up during that period.

Mr. *Preston*, manager at Winfield's works, and Mr. *Goodman*, a manufacturer in Birmingham for the last 30 years, were called to speak to the quality and to the abundant supply of the water furnished by the company.

Mr. *Thomas Statter*, examined by Mr. SAUNDERS.

I am a civil engineer and land and mineral agent, and have given a great deal of attention to the construction of water-works and the supply of water to towns. I have inspected the Birmingham Water-Works, partially for my own information on several occasions, and more lately I have visited them three or four times to inform myself fully as to the precise nature of the works for the purpose of giving evidence before this committee. Speaking generally, I may say they are remarkably fine works, and well executed for the purpose of supplying Birmingham with water. There are few works equal to them in the kingdom. Where difficulties have been experienced in supplying some localities, reservoirs have been set down in suitable positions, into which the water is pumped, and in this way all difficulties have been overcome. The water is an admirable one—as fine a water as could be produced. Not speaking of it chemically, but in a general way, I say it is a very beautiful water. The well water is extremely good, and the watershed is an extremely pure gathering-ground. It contains very little cultivated land; the bulk of it is in grass. It is not the fact, as stated in evidence, that the land is highly manured. I have gone over the ground and inspected it, and the facts in this particular are precisely the reverse of what Mr. Till has stated. It would be much better for the land if it were more highly cultivated. I call it poor land, and in need of attention. I visited several of the farms, and saw very little manure. Assuming the water to be filtered, and leaving the deep well water out of view, I cannot conceive how it could be condemned for its quality, seeing it is extremely pure in quality as well as large in quantity. On the gathering-ground I saw some of it running over gravel in a sandy bed, and in that state the water was quite transparent, and, properly filtered, I hold it could not be injurious to health. I know some towns in Lancashire which are supplied with water drawn from lands by means of gravitation works, and the quality of the water in many of these towns was far inferior to the Birmingham water. It is not necessary always to seek for a town's supply of water from the tops of mountains. You must take it as you find it. The Birmingham water is undoubtedly improved by being mixed with the well water. I have considered the desirability of water supplies being in the hands of corporations and public companies, and have attempted to solve it in a variety of ways. My conclusion is that I see no reason why the water supply should be in the hands of the corporation. I know of instances where the water supplies have passed from the hands of companies into those of the town's commissioners and public bodies, and I have no hesitation in saying that, although the management of the company had been decried, it had not been improved in the corporation's hands. On the contrary, in some instances, the corporations or public bodies had been infinitely slower in the discharge of their duties to the public than the companies had been. I am now referring to the expenditure of capital, and the application of the sanitary powers possessed by them.

Mr. SAUNDERS: Can you see any reason why these sanitary provisions should not be put in force in Birmingham?

Witness: I cannot. I am certain the law gives public bodies sufficient sanitary powers, although the water supply may be in the hands of a water company. As a proof of this I may instance Southport, where the water company, of which I am chairman, received notice from the corporation for the closing of the wells, and to fit up works for giving an adequate supply to the town. The same powers might be exercised in the case of Birmingham. I can conceive the mayor's evidence would be correct, and that a certain amount of strong feeling would be engendered in Birmingham by any attempt to enforce the Acts, and, consequently, if it could be at all avoided, they would not like to do it. At the same time, in my opinion they can do it. If they obtained possession of the water-works, I am of opinion they would give notice for the closing of the surface wells, and supply the town from the works; and it is proper they should do so, as the water is superior. The corporation do not commit themselves by this bill, and I think, even if it should pass, it would be absurd in them to go to other sources for a supply when they would already have an abundance at their command. I think the Birmingham people have done nothing for themselves, either providing gas or water. It has been done by individuals under the powers of various Acts of Parliament, and both the one and the other have been well done. At the same time it should not be forgotten the public have invested their money in these companies with the object of getting a fair return. The growth of the population being great, they could have no doubt that, however long they would have to wait, they would in the long run be recouped. I see no necessity for the Birmingham Corporation taking those works over, and actually compelling the company to part with their works. I have known cases where agreements had been entered into between the two parties for the transfer, and then come to Parliament to legalize it; but I have not known a case where the attempt was made, as in the present case, to wrest the property from the water company. The reason why it should not be done is that there is a prospective element of property to be considered, but which is often forgotten. It is not difficult to estimate this.

Cross-examined by Serjeant SARGOOD: No doubt it is a fact that water may be very bright and pleasant to the taste, and yet chemically impure and injurious to health. I know the gathering grounds of the Blythe. I am not aware that within the last 18 months 67,000 tons of Birmingham town sewage were sold to the farmers in that district. Going over the ground this year, I have seen no evidence of the land being manured, except the meadow and the arable lands slightly so. If manures had been spread on the land, and particularly town's manure, you would see signs of it at the bottom of the grasses. I did not inspect the bottom of the grasses to ascertain what sort of manure it was; but I walked through the land, and having had a good deal to do with land all my life, I could tell at once if it had been manured within a year or two. The wells cannot be shut up till a certain portion of the drainage is completed. I have not read the Public Health Bill now passing through Parliament, and cannot say whether a water-works clause has been introduced into it for the express purpose of enabling corporations or public bodies to have the control of the water supply of towns. I understand the same powers which the previous Acts gave were embodied in this bill, and very little power beyond them was given. I do not suggest that the transference of the water-works in this case to the Corporation of Birmingham would result in the depreciation of the shares, or that they have depreciated in value since the corporation took action to obtain the works. It would depend on the extent of the bonds of the corporation whether they would be as good investments, given in security for the purchase-money of the undertaking, as the shares of the company. The works could not be improved very much in any way. No doubt complete filtration of the water would be an improvement, but there is no reason why that could not as well be done by the company as by the corporation. I do not think it would be justifiable on the part of the corporation to spend two or three millions of money in obtaining a new water supply. It would be quite a mistake, because there is already an abundant supply.

Mr. *W. Pole*, examined by Mr. SOMERSET.

I am a member of the Council of Civil Engineers, and one of the metropolitan gas referees. I acted as secretary to the Duke of Richmond's committee, and have also been frequently employed by the Government in reference to questions of water supply. I have examined the works of the Birmingham Water Company, and I know of none that are better. I think great credit is due to the company for the way in which they have overcome the difficulties arising from the peculiar position of the town. I consider that their machinery and general arrangements are admirably adapted to the necessities of the population.

Mr. SOMERSET: The present supply of water to the town being eight million gallons a day, with a capacity to supply 17 millions, and the new works giving an increased supply of 23 million gallons when completed, do you think it necessary to go elsewhere for a supply?

Witness: No; I agree with the previous witness that there is no necessity to do so, as the supply is ample in quantity and good in quality. I was commissioned to examine the water supply of several large towns, and went to Manchester amongst other places. With regard to the manner in which the corporation manage the water supply in that city, I have nothing to complain of whatever. The rules are very stringent, and the waste is comparatively small. Some few years ago Manchester was put on a short supply; nevertheless, Manchester is a model town in respect to water supply. Birmingham has never failed in its constant supply. At Leeds the water-works are in the hands of the corporation, but they are not well managed. With reference to Glasgow, which is also a corporation supply, the waste goes on to a frightful extent, and, if not checked, sooner or later the constant service cannot be maintained. At Sheffield there has been considerable waste, but lately proper measures have been taken to diminish it.

The CHAIRMAN: Is it not possible for a water company to insist on the use of proper apparatus for checking waste?

Witness: They have the power to do so, but practically it depends upon the local Acts whether they can enforce their authority in that respect.

By Mr. SOMERSET: Norwich is quoted as a town which is supplied by a model company. I was so much surprised with the small consumption there that I measured it, and found the proportion smaller than in any other town, thus showing that the supply is very well managed.

Cross-examined by Mr. MICHAEL: I cannot tell the quantity of well water, as compared with water from the reservoirs, which is supplied to Birmingham. The whole of the wells were in action when I was there, but I could not say how much was supplied during the whole year.

Mr. *Bramwell*, C.E., examined by Mr. VENABLES.

I have examined the works of the company, and found them in admirable condition, ample in engine-power, and with great provision for the filtration and storeage of water. When the works are finished, there will be filtration for all the water not derived from deep wells, and the quantity and quality of the water is good and abundant. I do not think it desirable that a new and more distant source of supply should be sought. If that is done, at a cost of from two to three millions, the ratepayers will not thank the corporation for the outlay, for which provision will have to be made in some way or other, possibly from the gas profits. I do not see any advantage in the works being transferred from the company to the corporation. As long as the supply is in the hands of the company, and the government of the town in the hands of the corporation, there is a powerful public check. There is no malfeasance on the part of the company which would lay a foundation for such a transfer. On the contrary, the company have carried on the works very satisfactorily; they have been provident in their management and in anticipating the increasing wants of the people; they have beautiful wells, and they have filter-beds for the stream water, and they are preparing new filtration beds, which will effect the filtration of the whole of the supply. I do not see any public advantage in the transfer, because I think it is undesirable that a governing body should be a trading company.

Cross-examined by Mr. MICHAEL: As the works are in such good condition, and the corporation are authorized to control the water supply, I think they should have been allowed to inspect the works when they applied. I am in favour of the fullest possible facilities being given for inspection, in order that a thorough and complete investigation should be made. It might be advisable for corporations to have a power of purchase in some cases, as it would be a check upon the companies, and a transfer might be necessary in case a company did not do its duty. I think it is quite right that poor houses should have good water supplied to them, but it ought to be at the expense of the landlord.

The CHAIRMAN: Have not the corporation power, under their Act of 1851, to make owners of property supply water to their houses?

Mr. MICHAEL: Only if the water supply is in our own hands.

Mr. *T. Hawksley*, C.E., examined by Mr. VENABLES.

I have had many years experience in hydraulic works, and during my professional career have constructed nearly 100 water-works in this country and abroad. From time to time during the last 25 years I have been consulted by the Birmingham Water-Works Company, and I know all about their undertaking. They are very excellent works, and, with one or two exceptions, they may be called new. They are able to deliver double the quantity of water which is now required. I know the waters of the Blythe and Bourne. The Bourne is the better of the two, but the water of the Blythe is very good, except that it is harder. It comes from an extensive area of grass land, of which the geological formation is marl and new red sandstone. That, as every one knows, contains a small quantity of gypsum, which has the effect of giving a certain degree of hardness to the water. The area of the watershed is more than 70 square miles. I am of opinion that it is a watershed from which water may be safely taken for the supply of the town. The water of the Blythe is superior to many waters which are supplied to towns, and is only inferior to other waters which are in possession of this company. The Bourne water is better, and the deep well water better still. The well water is the softest. The company usually supply about half and half of river and well water, but the proportions vary on different days. Fully three-fourths of the river supply is already filtered, and half of the remaining fourth will be filtered in the course of the present year, leaving only one-eighth—namely, the produce of the Witton and Perry streams—to be filtered by works to be made next year. The works of the company need not fear comparison with the works of any other town. With regard to the alleged prevalence of

diarrhœa, I find, from a comparison of the returns of the Registrar-General for 1871, in the case of towns of the same population, that there was not an unusual prevalence in Birmingham. Assuming Dr. Hill's analysis to be correct, they would not show that the company's water was unwholesome. The company have 16 large engines, and raise their water a height of 450 feet, which is higher than water is raised by any other company in the kingdom. The supply per head is 38 gallons daily. The charges made by the company are very fair. I have looked into them, and I find that, taking into consideration the great expense they are put to in respect of the powerful pumping engines, the charges are moderate. I have looked at it in another way, having a great deal of experience on this point, to see what the per centage of expenditure is to the amount received, and I find that that is fair. Therefore, whether you reason from the expenditure upwards to the income, or from the income downwards to the expenditure, they are both fair as regards each other. From my experience I have not found that corporations manage water supplies better than companies. I have had more to do for corporations of late than for companies, and I can safely say the idea that a corporation can manage water-works better or cheaper than a company is a fallacy. They have not the motive or impulse—viz., the payment of dividends. I believe that the public are better served by a company watched by a corporation, than by a corporation watched by the ratepayers. The reason for this is, that when the public are served by a company they do not care for the company's expense; they are always seeking for some improvement, such as the imposing upon them of the obligation of filtering. But if the works are in the hands of the corporation, the small ratepayers will resist that expenditure. I have examined the capital and revenue accounts of the Birmingham Company, and I find that they are very moderate, considering the capabilities of the works and what they are actually doing. With regard to the case of Sheffield, and the opposition of the company to the demands of the corporation to enforce certain regulations in 1870 or 1871, I may say that I am the engineer to the Sheffield Company, and the matter is very easily explained. The corporation wanted to buy the works, and, of course, they wanted to buy cheaply. They, therefore, thought they had a right to inflict any injury—any fair injury—on the company they possibly could. The company were required, under an Act of Parliament previously passed, to change the system of supply on a particular day. Before that change could take place the corporation held a meeting, and gave the company notice for the change. In consequence of the impossibility of complying with this demand, an inquiry was instituted, which cost the company upwards of £4000, and resulted in regulations submitted by the company being passed, with some small exceptions. There are a few corporations who manage exceedingly well, but the great bulk of them manage their water supply exceedingly ill. The majority do not give a constant supply, because there is so much waste that they cannot maintain the continuity; while, on the other hand, there are very few private companies who do not give a constant supply. It has been said that in the Public Health Bill, brought into Parliament this year, the water-works clauses are incorporated; but the fact is that only part of the clauses are incorporated, and those which are left out are the ones of most benefit to the public. The clause insisting on constant supply is struck out, so that corporations under the bill will be able to give an intermittent supply.

Cross-examined by Sir E. BECKETT: The Blythe water is very good, but a trifle hard, arising from the presence of sulphate of lime in it. I have always advocated a constant water supply, but I object to a parliamentary obligation to give it being imposed by Act of Parliament.

WEDNESDAY, JULY 6.

Mr. *Hawksley* recalled, and further cross-examined by Sir E. BECKETT.

The capital required to be invested in water-works, which depend entirely upon pumping, is about £2 per head of population. For gravitation works, in which it is necessary to provide large storeage reservoirs, the cost would be £4 per head. The present works of the company are sufficient for about 600,000 people, at 30 gallons per head per day, or more, and the usual average quantity all the year round would be 25 gallons per head. At 25 gallons per head the works would provide for 700,000 people. Thirty gallons per head will not be necessary when we supply all the small houses, because they take smaller quantities of water, and no manufacturing water. Then the supply will not exceed 25 gallons per head per day, and in that case our works will be capable of supplying 700,000 people. I see at once that 700,000 times 25 makes 17,500,000 gallons daily. I think 20 million gallons would include the capacity of all prospective works. I am not here to defend the Blythe water, except to say that there is nothing harmful in it. The 2,500,000 gallons of filtered water from the Blythe is a very insignificant quantity among about 15 million gallons of other water, and after being filtered, as it is to be, at the rate of only 6 inches per hour, it is a very good, serviceable water, except in so far that it is a hard water.

Sir E. BECKETT: Have you any strong opinion against corporations getting possession of water-works?

Witness: No, not at all. But if you ask whether I consider that water companies or corporations conduct the business of water supply in the better manner upon the whole, I should say that companies do. I have, however, no strong opinions against corporations. On the contrary, I am continually occupied for corporations.

Sir E. BECKETT: In acquiring water-works?

Witness: Yes, constantly. I do not mean to say I accept a retainer when a corporation endeavours to seize the water-works of a company; because so strong are my convictions on that subject that I invariably refuse retainers.

Sir E. BECKETT: I am not asking about this case.

Witness: I act more for corporations than for companies; and the largest corporations in England.

Sir E. BECKETT: I see you have modified your opinions since the year 1870, for then you told their lordships that corporations were as much the natural enemies of companies as the pike is the natural enemy of the trout.

Witness: If I did, it is very true; but I do not recollect it. I do not think I could express myself better.

Cross-examination continued: By the Edinburgh Water Bill of 1869 the company transferred their works to the corporation for permanent annuities secured on the income of the corporation. In the Bolton Act it is prescribed that the annuities shall be paid off at 25 years purchase. In the Edinburgh case the terms of transfer were the payment of annuities of 6 per cent. on £414,000, and a cash payment of £22,000. I cannot tell what the maximum dividend of the Edinburgh Company was, but it was a very low sum—£5 10s. per cent., I believe, on a portion of their capital.

Re-examined by Mr. SOMERSET: The 35th section of the Act of 1870 gives power to the corporation to appoint any person, within any reasonable time, to test the waters of the company at the works, both as to quality and quantity. That never was done by the Birmingham Corporation until this bill had been before the other House. I know of no instance of Parliament conferring on corporations compulsory powers to enable them to take over water-works. I affirm that my experience leads to the conclusion that water-works are better managed by water companies than by corporations. Water companies are more under the influence of that moral and social control than corporations are. I have never given but one opinion on the river Blythe, and will give it again. It is that of all their waters it is the most inferior, but that it is a good water for the supply of the town I do not deny. But a great many of the waters of the company are better than the Blythe. In the driest seasons the Blythe and Bourne would give four million gallons per day, and, by the construction of the contemplated reservoir, this would be increased. The droughts are long, and the capacities require to be divided by the number of the days of drought. In this way it would be found that to four millions the reservoir would add two millions. That only applies to the driest seasons, and to the driest periods of such. Of course, the floods and ordinary flow, coming down from 100 square miles, would largely add to this quantity; but, for water-works purposes, we always base our calculations on the driest periods of the driest years.

Sir E. BECKETT then replied upon the whole case, and, after referring to the purchase power of the corporation in the Act of 1851, and the contention on the other side as to that power having lapsed, he proceeded to speak of the desirability of the transfer being made. As to the general proposition of no compulsory bill being passed without previous agreement or consultation, he could afford to make a present of it to his friends. It was almost unnecessary, after the evidence of the mayor, to dwell at any length on the advantages and value to the corporation of having these works under their immediate control. It might, however, be put in a very simple way. The present purchase in the bill, assuming that to stand for a moment, was £1,100,000, which was 23 years purchase of £47,712, the interest of the present paid-up capital, entitled to 8 and 7 per cent. Supposing the corporation had had these works in their hands from the very beginning, and spent the same sum of money—viz., £620,000, the corporation would raise that at 4 per cent., representing £24,800, which would be the total charge on the town, instead of £47,712 a year. That was one illustration of the value of having the works in the hands of the corporation. On the other hand, they had had before them the chairman of the company, who could give no reasons why the corporation should not take over the works; and they had Mr. Shaw and other people saying that the interests of the company and corporation were identical.

The CHAIRMAN: If you had bought them in 1871, what would you have saved?

Sir E. BECKETT: £26,000. The corporation have always been stupid on this question, although there have been a few intelligent men who could see through the whole business perfectly well. If the corporation had borrowed at 4 per cent., instead of the company getting the dividend they are now paying, the town would consequently be all the richer. There was no getting over it. At the time the company increased the rates they were paying 6½ per cent., and by this movement they raised their dividend to the maximum.

Mr. SOMERSET said they did not raise their rates. They revised the assessments, the rents remaining the same. The company revised 15,000 accounts, and no doubt a great majority of the customers paid more, but some few of them paid less.

Sir E. BECKETT said it was of no consequence how it was done, but the fact remained that they did something, the effect of which was to raise their income from £37,000 to £47,000 a year. This fact was the best possible answer to the arguments, that it was more advantageous to the town that the works should be in the hands of a company than of the corporation.

The room was then cleared, and, on the parties being readmitted,

The CHAIRMAN said: The committee have come to the decision that, in consideration of the Birmingham Corporation having had, in 1851, an Act enabling them to purchase the water-works, they will pass the preamble, giving them power to take over the works of the company; but they will take care, in going through the clauses, which they would not then argue, that the stipulations secure to the company the full value of their works. The committee were inclined to think all parties might come to some arrangement, either by arbitration, or according to the terms of the Act of 1851, under the Lands Clauses Consolidation Act.

Sir E. BECKETT said the reason why the promoters did not insert the same provision as was contained in the 1851 Act was that since that time a practice had grown up among arbitrators of always treating purchases under the Lands Clauses Act, as if there ought to be an arbitrary price added. Their lordships would remember that in the Birmingham Gas Bill the outside districts were given a power of purchase under the Companies Clauses Act, and in the present case his clients would prefer to leave the arrangements under that Act.

WEDNESDAY, JULY 7.

At the sitting of the committee this morning,

Mr. VENABLES asked for an adjournment for the completion of arrangements, and

Mr. MICHAEL, having stated on behalf of the promoters that they had no objection to such a course,

The CHAIRMAN intimated that the committee would adjourn till Friday.

FRIDAY, JULY 9.

The preamble of the bill was postponed, and the committee proceeded with the clauses.

On clause 2, relating to the terms of purchase,

Mr. MICHAEL said he was prepared to call evidence in favour of the clause as it stood.

Mr. VENABLES said the promoters and the company not having been able to come to an understanding on the point, the latter proposed to fall back upon a settlement of the terms by arbitration under the Lands Clauses Act.

Mr. MICHAEL said the clause as it stood provided for the purchase of the undertaking at a price equal to 23 years value of the maximum dividend of the company, whether in a gross sum or in the shape of annuities.

Mr. VENABLES said the decision of the committee was founded upon the right of purchase which the corporation had under their Act of 1851, he contended that the company were entitled to obtain the full and fair value as under that Act, and as laid down under the Lands Clauses Consolidation Act. The provision in the 1851 Act was that the company were to sell and convey on such terms as might be agreed; and, in case the parties should not agree, the price of the purchase should be settled under the provisions of the Lands Clauses Consolidation Act, 1845, relating to the purchase of lands otherwise than by agreement. If the claim of the promoters was founded on the Act of 1851, there could be no reason why the company should not be entitled to abide under the provisions of that Act, which moreover were intrinsically just. His clients had considered the whole question carefully, and they had come to the conclusion that they could not lay their case fairly and fully before their lordships, with any reasonable chance of their lordships having time and disposition to attend to it, so well as before an arbitrator. They therefore proposed, purely and simply, that everything should be arbitrated upon under the Act he had named. As to whether, when the value was ascertained, it was to be paid by annuities or in a lump sum, he thought there would be no difference of opinion, power being given to the arbitrators to award either. Sir E. Beckett seemed to think that arbitration under the Companies Clauses Act was more favourable to the purchaser, and if so, it implied that the Lands Clauses Act was more favourable to the vendor. If that was the case, and the 1851 Act provided for that, he thought the company were justly entitled to ask for it now. He therefore proposed that clause 2 should read thus: "The corporation may, at any time within three years after the passing of this Act, by writing under the common seal, addressed and sent to the secretary, or delivered at the principal office of the company, require the company to sell their undertaking, property, rights, powers, and privileges to the corporation, and thereupon the company shall sell to the corporation and the corporation shall purchase from the company their undertaking, property, rights, powers, and privileges, as the same exist at the time of purchase, for such full and

fair consideration in perpetual annuities, and on such terms as the company and corporation agree, or, in default of agreement, as may be settled by arbitration in the manner provided by the Lands Clauses Consolidation Act, 1845, to settle cases in dispute of compensation." He was not aware of any transfer of this kind in which the arbitration had not been, except by agreement, under the Lands Clauses Act.

Mr. MICHAEL said, as to the fact itself, his learned friend was in error, and with reference to the decision of the committee, it was that their lordships would see that the stipulations of the bill secured to the company a full and fair value. He was prepared to give evidence that the terms in the bill were full and fair.

The CHAIRMAN said he did not think that by the words of the decision the committee were bound to decide what full and fair terms were; the full and fair value might be secured otherwise than by a valuation on their part.

After some further conversation the room was cleared, and, on the parties being readmitted,

The CHAIRMAN said: The committee are of opinion that the matter should be determined by arbitration. It will now be competent for counsel to argue as to which mode of arbitration should be adopted.

Mr. MICHAEL reminded their lordships that, in the Corporation Gas Bill just passed by them, arbitration under the Companies Clauses Act was provided for in the case of purchase of parts of the undertaking by outside districts. That mode of arbitration was put in because it was less cumbrous, and because it was fairer to all parties. In 1851, when the Birmingham Improvement Act was passed, the Lands Clauses Consolidation Act had been but recently passed, and there had been very little experience of its operation—certainly not sufficient to lay down any fixed principle as to compulsory purchase. In truth, the Act was framed rather in view of cases of compensation for damages than of the valuation of property on transfer. In the present case the question was one almost entirely of the price to be given for an undertaking earning a certain income. It was not a valuation of lands as contemplated by the Lands Clauses Act, but of profits to be purchased, which should be estimated by the simplest possible mode. If it was a question of paying more under one Act than another, why should the committee place an additional burden upon the corporation? He should be content for the arbitration to be by an arbitrator appointed by their lordships, or by the Local Government Board, or under the Common Law Procedure Act, or by the Companies Clauses Act. If by the operation of a certain Act a burden would be imposed upon one side or the other, why not, in the interests of fairness, take it out of the category, and make the arbitration a perfectly fair and impartial one? Although, on the one hand, it was quite right that the company should get a fair value for their property, the ratepayers of Birmingham, on the other hand, ought to be protected against having to pay a fictitious value by the operation of a certain mode of purchase.

Mr. VENABLES said there was no provision for the assessment of the value of an undertaking, unless by consent, except under the Lands Clauses Act. And the proposition was quite in accordance with the terms of the Act of 1851.

Mr. MICHAEL said that a recent transfer of telegraphs to the Government had been made under another Act, and not under the Lands Clauses Act.

The room having been again cleared, the committee consulted. On the doors being opened,

The CHAIRMAN said: The committee have decided that the arbitration shall be under the Lands Clauses Act.

Mr. MICHAEL asked that in that case the words "full and fair" should be struck out of the clause. The words were in themselves unnecessary, and might, if retained, be used to impress upon the arbitrator that the committee had expressed some opinion as to the value of the undertaking.

Mr. VENABLES said he could not see what objection could be fairly taken to the words, but

The COMMITTEE decided that the words should be struck out.

Upon clause 5, which ran as follows:—"The mortgage debt of the company at the time of the transfer, and the interest thereon, shall, after the transfer, continue to be a first charge on the water-works undertaking," it was proposed to add, "in the hands of the corporation, and shall then be a charge on the borough improvement rate, the borough fund, and the borough rate, in priority to all charges made thereon respectively subsequent to the passing of this Act, and on the general district rate of the borough."

Mr. MICHAEL submitted that, as there was no general district rate, to make the improvement rate the first security would occasion considerable inconvenience to the corporation, while it would be no better security to the company.

The clause was amended by omitting the words "general district rate."

Upon clause 19, relating to the winding up of the company,

Mr. SOMERSET proposed to insert a provision giving the directors power to retain £10,000 in hand, for the purpose of defraying the necessary expenses, such as compensation of officers, &c.

Mr. MICHAEL strongly opposed the proposition, and

The COMMITTEE decided not to accept the proviso.

On clause 20, relating to the borrowing powers of the corporation, an alteration was agreed to, fixing the limit at £1,000,000, instead of £1,100,000. The term of redemption of the annuities issued on the security of the borough rates for the money raised for the purposes of the Act was fixed at 25 years.

The other clauses with amendments having been settled, the preamble was taken into consideration, so as to make it conformable with the alterations made in the clauses.

The preamble was then passed, and the chairman was directed to report the bill to the House.

The CHAIRMAN, addressing the representatives of the borough, said: One thing has been suggested to me, and I may perhaps mention it here, and that is, that it would be a very good thing if the Corporation of Birmingham, when they get the water-works into their own hands, should set an example, not only to the town of Birmingham itself, but to the rest of the great manufacturing towns in England, by consuming their own smoke.

The MAYOR: I assure your lordship that I shall bring your lordship's suggestion under the notice of the Birmingham Corporation at the earliest opportunity.

The CHAIRMAN: And I hope you will impress upon them the necessity of their acting upon it.

HOUSE OF COMMONS COMMITTEE.

TUESDAY, JUNE 25.

(*Before the Right Hon.* W. E. FORSTER, *Chairman; Mr.* S. B. BRISTOWE, *Mr.* J. G. TALBOT, *Mr.* T. BRASSEY, *and Mr.* H. BIRLEY.)

COMMERCIAL GAS BILL.

Mr. VENABLES, Q.C., Mr. POPE, Q.C., and Mr. MICHAEL, appeared for the promoters; Mr. WEST, Serjeant SARGOOD, and Mr. BROUGHTON for The Gaslight and Coke Company; and Mr. LITTLER and Mr. O'HARA for the Poplar District Board of Works, petitioners against the bill. Petitions were also presented by the Metropolitan Board of Works, for whom Messrs. DYSON and Co. appeared as agents, and also the Vestry of Mile End Old Town, but no counsel appeared in support of the latter petition.

Serjeant SARGOOD applied to the committee, on behalf of the Chartered Company, for an order upon the Commercial Company to produce their books and accounts from the time of the passing of the Act of 1860 to the present time.

The CHAIRMAN intimated that perhaps the Commercial Company would have no objection to produce them, and that therefore an order would not be required.

Mr. VENABLES said the Commercial Company would object to the application.

The CHAIRMAN said the committee would not entertain the question until the bill was before them.

MONDAY, JUNE 28.

Serjeant SARGOOD applied, on behalf of the Chartered Gas Company, that the bill of the Commercial Company should not be considered for two clear days, and he asked this on the following grounds:—That, notwithstanding the bill had been on the committee's paper during the 20 days they had been sitting, and repeated complaints had been made that no amended bill had been lodged in the office, and notwithstanding weeks ago he was going to make an application on the subject, and was stopped by an assurance, both from the agent and the counsel, that there were no amendments, an amended bill was lodged yesterday, in which out of 135 clauses 26 had been struck out entirely, 14 clauses and a schedule were entirely new, and 26 of the clauses had been altered. He had known a new bill to be asked for by the committee under such circumstances. The Standing Order required that an amended bill should be handed in two clear days before the hearing.

Mr. LITTLER supported the application on behalf of the Poplar Local Board.

Mr. VENABLES hoped the committee would not comply with the application, the object of which was to endeavour to defeat the bill by the efflux of time. On the previous Friday the committee had given their decision on the preamble of the Metropolitan Gas Companies Bill, and the whole of the amendments were, in substance, an adoption of the decisions of the committee, which were not known before. The Chartered Company knew from the first that it was intended to frame the bill in accordance with the decision of the committee, and that the Commercial Company intended to submit to the legislation proposed by the Metropolitan Board. The Standing Orders had been literally complied with. There had been large additions, but every one of those additions was merely carrying out the decisions of the committee.

The CHAIRMAN said, without entering into the merits of the question, he thought it was the wish of the committee to go on as quickly as they could, unless there was a clear proof of damage by over haste.

After some further conversation, it was decided not to go beyond Mr. Venables's opening speech on the following day.

TUESDAY, JUNE 29.

Mr. WEST renewed the application for an order compelling the Commercial Company to allow the Chartered Company to inspect their books and accounts from 1860 to the present time.

Mr. VENABLES opposed the application, there not being a single word in the petition of the Chartered Company about the accounts of the Commercial Company. The committee had required further information, and they would have it; but the Chartered Company had not asked for any.

After considerable discussion,

The CHAIRMAN stated that if, in the course of cross-examination, any information was required by the Chartered Company, but could not be obtained, the committee would help them to get it.

Mr. VENABLES then proceeded to open the case on behalf of the Commercial Gas Company, who, he said, asked for power to raise futher capital, to acquire a new site and to construct works thereon, and for an amalgamation with the Ratcliff Company; and, in the amended bill, all the provisions of the general bill, as approved by the committee, were introduced. There were one or two points in which they asked for a slight variation, but if the committee thought they had not established a case for these variations, it would not prevent the company proceeding with their bill. Having described the boundaries of the Commercial and Ratcliff Companies, the learned counsel stated that the Commercial Company was founded in 1836 as a joint-stock company, and was incorporated in 1847 with a capital of £150,000, at the same time incorporating the provisions of the general Gas Act of that year. In 1850 they promoted another Act, by which they incorporated a small company called the Poplar Company. In 1852 they obtained power to incorporate the London undertaking of the British Gas Company, and to increase their capital to £400,000, with £50,000 borrowing powers. Subsequently that £50,000 was, under the provisions of the Companies Clauses Act, converted into share capital, so that the company had at present a share capital of £450,000, fully called up, and nearly or quite expended. The Ratcliff was a small company, incorporated in 1823, with a capital of £100,000, with borrowing power of £15,000, of which £10,000 was exercised, and £5000 not exercised. The Commercial Company had never been in Parliament since 1852, except that, in common with other companies, they watched the legislation of 1860; but they took no part in the later legislation, or attempts at legislation, in the years 1867, 1868, and 1869. The company were for many years in an unprosperous state, and underwent great difficulties. For some time they paid no dividend, but about 1854 the late Mr. Butler, M.P. for the Tower Hamlets, became connected with the company, and exerted himself very much to restore their prosperity. Mr. Robert Jones was at that time appointed engineer, and the company subsequently attained considerable prosperity, and was, at the present time, one of the most successful in London. The only difficulty was that they could not supply as much gas as their customers required. The power of raising capital having been exhausted for some years past, the directors had been much pressed with the necessity for getting additional resources. In 1860 they had a reserve of 90 retorts, but at present they had no reserve at all. They had been obliged to work up to their full power, and it had occasionally happened, when there was a great demand in winter time, that they had not actually been able to manufacture gas equal to the supply, but had to draw upon their stores, which were considerable; so that if the demand had continued uninterruptedly for some time longer, they would probably have fallen short. At the same time they had watched carefully the state of the capital account, and they were exceedingly unwilling, until it became necessary, to increase their capital by getting a new site. It would be shown that the present works had been constructed with skill and economy, and that they were exceedingly well managed, but from their situation they did not admit of extension. For three years the engineer had represented to the directors the necessity for providing the means for an additional supply, and after a most careful examination of the sites which had been presented for their choice, they had entered into a contract for the purchase of a piece of land on the right bank of the river Lea, almost immediately opposite the Imperial works, and within their own district of supply. There were no charges upon that river, and that would enable the company to land their coal very cheaply and conveniently. The company had contracted for the land at the rate of £2000 an acre, which in that district was a very unusual price indeed. They had an unexercised power of taking 11½ acres of land, and, therefore, they had applied that power to 11½ acres, and had a provisional contract for taking 8½ acres more, making 20 acres. That was on the assumption that they obtained the powers they sought for. The works the company proposed to erect were estimated at £120,000, but they did not propose in the first instance to expend more than £80,000, the works being designed in such a manner that they could be extended as required, until they reached the full estimate of £120,000. The company had every reason to suppose that their consumers always had been, and still were, fully satisfied with them. They had the approval of every local authority in

the district, with the exception of the Poplar Local Board, who opposed on other grounds, they having jurisdiction over the place where the new site was situated; and, although the Metropolitan Board appeared on their petition, and would probably have some representations to make, generally the company had reason to suppose that the Metropolitan Board were not opposed either to the new site, to the increase of capital, or to their amalgamation with the Ratcliff Company. They had a very inveterate and acrimonious opponent in the Chartered Company, as might be inferred from the numerous opportunities they had already taken in exhibiting it. As regards the raising of capital, there had been a considerable variation between the original proposal and that in the bill before the committee. The first proposition was to raise it at 10 per cent., but that was now altered to 7 per cent., and there was the further proposition that one half should be raised on loan, which was a larger proportion than had ever yet been raised by any company, upon such terms as they could obtain it, not exceeding 5 per cent. The sliding scale would be introduced as a matter of course. The Board of Trade had expressed a very strong opinion against any gas company in London raising money except at the lowest rate at which it could be raised, and the Board suggested that the whole should be raised by preference or loan; but why were the present shareholders, unless they obtained a consideration for it, to have the new capital entirely preferred to the old, because, of course, the debt would take precedence of the old capital. As the bill was originally framed, there would have been £450,000 share capital, and one quarter of that in loan; but the company now added the whole together, and proposed to take half by shares and half by borrowing powers; and, in consideration of so putting the loan capital over the whole of the existing capital, they had a reasonable claim to raise the remainder in such a manner as might give the shareholders some interest in raising it. The committee had had it in evidence that there had been times when even 7 per cent. gas shares could not be floated, and such a thing might occur again. There were in England about 400 gas companies with parliamentary powers, and, with two or three exceptions, they were all allowed a premium on their new capital; nor had the Board of Trade ever interfered in the matter. It was quite a new theory that that board were to take the place of Parliament in legislating in this matter. The Board of Trade exercised a judgment, but they had never assumed to dictate to Parliament what the rate of raising money should be, nor would Parliament ever have accepted the dictation, because the committees—which for those purposes represented Parliament—had the opportunity of knowing all those matters infinitely better than the Board of Trade could know them. In the present case the company said their shareholders had always had a reasonable expectation that Parliament would continue the same policy it had hitherto—of giving a liberal, though not an immoderate, rate of interest upon new capital to be raised. That might not amount to a legal right, but it was a right which had undoubtedly affected the value of the shares, and nobody could be supposed to have bought the Commercial gas shares for years past without seeing that the capital would very soon be exhausted, and that it would be necessary to apply to Parliament for new capital, and that that advantage would be taken into consideration in the rate given for the shares. There was no reason to suppose that the consumers objected to the proposal of the company, and therefore the Board of Trade was the only opponent they had to fear, because the Chartered Company had nothing to do with the matter. It might, moreover, be said that while Parliament took care to remove any temptation to issue capital unduly, it was rather important that companies should be encouraged not to be backward in raising capital when they wanted it. In the present case there was a proposal to reverse the whole policy of Parliament, and the company did not see that there was any want of merit on their part which should cause them to be made the first victims of that arrangement. It had been already stated that the company, having used to the utmost their existing resources, could not supply the gas required for the advantage of the public without spending a large additional capital. It would take £120,000 for works, and £40,000 for the purchase of the land, making £160,000; the remainder would be necessary for the expansion of the undertaking during the next 12 or 14 years. At the time the company were considering that expansion, they also took into consideration the expediency of amalgamating with the Ratcliff, which was a small company with a limited district. It so happened that while the Commercial company had no longer any reserve of manufacturing power, they had some reserve of storeage power; but the Ratcliff Company, on the other hand, had a reserve of manufacturing power, but were rather pressed for storeage, so that it was the interest of both companies to obtain some extension. A small company like the Ratcliff could hardly have entered upon an undertaking for erecting new works at a distance, but, by combination with the Commercial, it would share in the advantage of the new site; and, moreover, the existing works, which in both cases would be retained and used to the utmost, would be able, to a certain extent, to supply one another. It also happened that, from the local position, there would be great facility in combining distributive apparatus. There would also be a perceptible saving by the amalgamation of the two boards. The Commercial Company had managed their affairs so well that they stood third among the London companies in the proportion of capital to manufacture—that was to say, per 1000 feet sold. That was a curious fact, to which the attention of the committee was invited—that the prosperity of the companies varied always inversely to their magnitude. The capital of the Independent Company, which was a small one, was 10s. 6d. per 1000 feet sold, the South Metropolitan was 10s. 1d., the Commercial was 11s. 8d., and the Ratcliff 12s. 7d. That was in 1873, but the proportion would be closer for 1874, and, of course, it would further diminish as the consumption increased. That was to be compared with 17s. 5d. for the Imperial, and 19s. 3d. for the Chartered. The committee knew that that element of proportion of capital to consumption was the very basis of all cheapness. The best proof of this was that, during the high price of coal, the Commercial Company never exceeded the 4s. charge, although, under the provisions of the Act of 1860, they might have raised their price to any limit within 5s. 6d.; and some time since they reduced it to 3s. 9d. The Ratcliff Company, during the whole dearth of coal, never went above 3s. 9d. Having said that much, he (the learned counsel) thought there was nothing left but to go to the petitions, although he might state, as a proof of the necessity for additional capital and for new works, that it would be shown that the company could within the last year have sold a very large quantity of gas more than they had done if they could have made it; and, as the demand increased, unless they had additional capital and works, they would be still more unable to meet it.

The CHAIRMAN: When you say you could have sold more, where did the people get it from?

Mr. VENABLES said he supposed they were manufacturers and others who had to do with less gas, because they could not get it anywhere else, but that would be stated by the engineer. The Commercial Company at present supplied about 1000 million feet of gas a year, but with the new works they would be able to add about 6000 millions to their present supply; and the Ratcliff was in somewhat the same proportion. That was a matter which seemed to be purely for the public benefit, and who opposed it? They had the Chartered Company; they had the Poplar District Board, whose opposition was entirely upon a secondary ground; and they had the Board of Trade, on general theories of their own, opposing the bill. Whether that board had consulted any engineer he (Mr. Venables) did not know, but if they had they could hardly be of the same rank as those who supported the bill. They had one exceedingly able adviser—Mr. Wyatt, their parliamentary agent—but they could not have consulted him in the present case, because he was acting in the interest of the Chartered Company, and he would say that any information he could give would be tainted by the case of that company. The Board of Trade had looked at the map, but they had looked no further, and consequently they had fallen into a great blunder, and the committee would find that their opinion was opposed to that of every skilled person, except the skilled persons advising the Chartered Company, which company had a very strong interest in damaging the useful, popular, economical, and advantageous schemes of the Commercial Company. The first petition to be referred to was that of the Metropolitan Board which had been deposited while the bill was in its original shape, and represented the opposition which would have been prosecuted if the bill had not been altered. In that petition the board referred to various clauses, most of which had since been altered, and therefore it resolved itself really into a watching petition. With reference to the petition of the Poplar Local Board, the learned counsel contended that they could not support the allegation they made, that the works would be a nuisance and a disadvantage to the neighbourhood, for the district was entirely a manufacturing one. In the immediate vicinity of the new site there were about 20 manufactories, some of which were much more offensive than a gas manufactory. A strong point in favour of this view was to be found in the fact that the gentleman from whom the site had been purchased possessed a large quantity of land adjoining the site, and though he knew what use the company were going to make of the land, he raised no objection on the ground of probable deterioration of his property. The Poplar Local Board should be reminded that the rateable value of the district would be increased by the erection of the proposed works. The Local Board also represented that there was some objection to conveying the gas from the proposed works to the district to be supplied, but the company required no new power for that, because they were within the district, and were in possession of all necessary powers. The petition also went into questions about the price of gas, the rate of dividend, and so on, but those subjects had been discussed on the general bill, and the committee had determined there should be uniform legislation; and it was perfectly clear that, if uniform legislation were required, the Metropolitan Board were the proper body to obtain it. Respecting the petition of the Chartered Company the learned counsel stated that he was going to submit that they had no *locus standi*. In their petition they went through a long story of the whole of the gas legislation, which he would not follow, but in paragraph 19 they stated, "The respective committees of the House of Commons of 1867 and 1868 expressed an opinion that great economy would result from the amalgamation of your petitioners company and other metropolitan companies, and urged that as one of the reasons why your petitioners should accept the terms and conditions imposed upon them by such committee." The Commercial Company did not propose to interfere with any amalgamation which had been effected; they only said that the Chartered Company had not illustrated the advantages of amalgamation, the price charged for their gas last year having been 5s. The petition also stated that the Act of 1868 contained powers to enable the Chartered Company to supply gas in bulk, but what right did that give them to oppose the present bill? They had the power to agree with anybody who would agree with them, but they had no right whatever as against anybody who did not agree with them. It appeared to be the absurdest claim to oppose a bill on the ground that the company found it more economical to make their own gas than to buy it from another company. The petition also stated that the Chartered Company had acquired a very large tract of land in an unpopulated district facing the river Thames at Beckton in which they had erected, and were still constructing, very large works. So they were for their own use, and if they could get anybody to buy gas they could sell it, but they had no power to sell that gas to any body who did not want to buy it. Another clause in the petition was, "One of the chief objects of conferring upon your petitioners the right to amalgamate their undertaking with all the gas companies in the metropolis was to secure throughout London an improvement in illuminating power and uniformity in the manufacture and supply of gas." That might have been the object, but the company knew no more than he (Mr. Venables) did as to whether it was so. "Parliamentary powers exist for amalgamating the Commercial and the Ratcliff Gas Companies with the undertaking of your petitioners." Those powers to which they referred were contained first in the City of London Gas Act of 1868, section 18, but they applied only to the City of London and the Great Central Companies. In their Act of 1871, however, by which they amalgamated with the Equitable Company, there was a clause which the other companies ought to have noticed, but which they did not—"Sections 18 to 24 inclusive"—which were the sections of the scheme for amalgamation—"shall, taken in connexion with the amalgamated company, extend and apply to the several gas companies supplying gas within the metropolis, as defined in the Metropolis Gas Act, 1860." Therefore by that Act the provisions of the Act of 1860 became applicable to all the companies, but, as in the case of selling gas, it was all voluntary. Under the powers of 1868 and 1871 the Chartered Company had amalgamated with four other companies, and those four companies had, immediately before the amalgamation, a capital which worked out to 14s. for every 1000 cubic feet of gas sold, while at the same time the Chartered Company had an average of about 20s. per 1000 feet. Each of those four companies were paying full dividends, and some of them were filling up their reserves, so that the consumers of each of them would soon have been entitled to a reduction of price, and not one of those companies would have been compelled to have gone to anything like 5s. during the dearth of coals. By the amalgamation of those companies, in pursuance of the urgent recommendations of the Board of Trade, the Chartered Company, who would otherwise have been in considerable difficulty, were enabled to appropriate to themselves the surplus that would otherwise have gone to the consumers, and even then were compelled to raise their price to 5s., and that was the blessing of unlimited amalgamation. That company now contended that instead of the Commercial Company amalgamating with the Ratcliff, both companies should amalgamate with them; that was to say, that two companies which had about 11s. of capital per 1000 feet of gas sold should lump themselves up with a company which had about 19s. per 1000 feet; and a more audacious statement he (Mr. Venables) thought had never been made. The fact was both Parliament and the Board of Trade were utterly mistaken. The Board of Trade would take a good deal to convince it, because they did not appear to have studied the question, and they had not had the valuable assistance of Mr. Wyatt, who was the only person who could have told them about it. Of course, if that gentleman had not been bound by his connexion with the company not to give any advice at all, he could have said that the Chartered amalgamations, which were thought such a blessing, had been found the most unmitigated evil which had ever taken place in the history of the gas supply of London. But the Board of Trade had never heard that much. What *locus standi* had they to insist on an amalgamation which could only, under the Act of Parliament, be effected when it was voluntary? Paragraph 27 of the petition stated, "The mains of your petitioners pass through the districts of the Commercial Gas Company and the Ratcliff Gaslight and Coke Company, and your petitioners submit that if either of those companies require an additional supply of gas, they might obtain the same from your petitioners, and thereby save the expenditure of money contemplated by the said bill;" but to accomplish that end they would either have to charge an exorbitant price, or impose an additional tax, having Heaven knew, imposed tax enough already on the unfortunate consumers, whom they professed to represent. It would be found that every local authority in the district, while they favoured mildly the amalgamation of the Commercial with the Ratcliff Company, was vehemently and earnestly opposed to any possible amalgamation with the Chartered, arising from the obvious reason

that the Chartered Company had made a very good thing out of the delusions which prevailed a short time ago, and had saved themselves from the very inconvenient position of a deficient dividend. They had raised the price higher than anybody else, and yet, owing to the accidental disadvantage of not having good advice, the Board of Trade had gone into all those Chartered delusions. The Board of Trade said—and it was not the first time they had said so—that the districts in the metropolis were fixed haphazard. They stated, "It is further to be observed, with respect to the Commercial Company, that the great main of the Chartered Company from their works at Beckton passes through and under the districts of the Commercial and Ratcliff Companies, and the former seeks to construct new works. It seems *primâ facie* to deserve particular consideration whether, in lieu of constructing new works, it would not be good economy to make use of the gas from Beckton." *Primâ facie* meant looking at the map, and nothing more. It so happened that the large main from Beckton had not a foot of gas to spare; it was absolutely required for their own wants; and although they could manufacture an unlimited quantity by putting up additional works, if they wanted to supply the promoters with gas, they would undoubtedly have to put down a new main for the purpose.

Mr. BIRLEY: Is there any idea of removing the existing Ratcliff works when the new works are erected on the river Lea?

Mr. VENABLES: We shall keep both the works in full use. Our new works are intended only to supply the deficiency.

Mr. BIRLEY: I thought it would be a great advantage to the City if the Ratcliff works were removed by-and-by.

Mr. VENABLES said they were not in the City at all. Nobody at present proposed it, and it was much more economical to the company to keep the works where they were. If they could extend the Ratcliff works indefinitely it would be a very good plan. They were well situated on the river, while the Commercial works, being on the canal, had the disadvantage of canal dues; but they would both be worked to their full extent. It would be a wasteful thing for the companies to sell them. The Chartered Company had as much as they could do to make the works at Beckton supply their own wants. They could by a certain outlay supply the promoters, but it would cost more to carry it several miles further than it would to make the new works. The Board of Trade went on to say that "whatever might be the pecuniary position of the different companies, it certainly appears absurd that large works should be constructed at the east of London for supplying the western districts, and that at the same time, in lieu of utilising those works for the districts nearest to them, and through which their mains run, new works should be constructed by a different company in those districts. Such an arrangement would, at any rate, never have been permitted but for the present haphazard arrangements of the several companies districts." What was meant by "haphazard?" The "hap" and the "hazard" were both owing to Parliament having acted upon the recommendations of the Board of Trade. The Chartered Company were comparatively compact before; but all the rest of the district that had come to it, had come through those different amalgamations, and that was what made the map look so awkward. The promoters district was lying exceptionally close together and compact, and why were they to suffer for the haphazard arrangements of the Chartered? There was a limit which different gas engineers could put at different magnitudes, but which they could agree was an appreciable limit, within which the maximum of economy in the manufacture and distribution of gas was effected. When the limit was passed, the capital in directors salaries might be saved—which were perfectly insignificant in a large concern; but there was nothing else which could be saved. The Imperial Company consistently said that they did not care for amalgamation, although they applied for general powers, and the result was that probably they were quite right. In the present case the Chartered Company could only supply the promoters with gas on dearer terms than they could supply themselves; but whether they could or not, they had no right to apply for compulsory powers of supply. With respect to amalgamating a they had no interest in it whatever, because it did not interfere with their rights, and the power of amalgamating was entirely and exclusively voluntary. On those grounds he (Mr. Venables) objected to the *locus standi* of the Chartered Company.

Mr. WEST said his learned friend's argument against his clients having a *locus standi* was a very remarkable one, inasmuch as he had stated a number of facts, every one of which would be disputed, and which he alleged would be all matters of evidence. His learned friend made a most inconsistent statement when he said that the Chartered Company had the strongest interest in defeating the present bill. If they had the strongest interest, could a stronger argument be adduced that they had a right to be heard? He had a technical answer to his learned friend's objections, which would be perfectly conclusive. Every member of the committee was aware that a few years ago the House of Commons surrendered its jurisdiction as to *locus standi* to a committee of referees, and therefore they were the persons before whom the objections should have been taken.

Mr. VENABLES said he went before the referees, but they declined to hear him.

Mr. BRISTOWE said he was present on the occasion, and the referees thought they were put aside by a distinct order of the House.

The CHAIRMAN said his opinion was that the committee were placed in the position of the referees to decide the question.

Mr. WEST submitted it was the duty of the committee to refer the question back to the referees for decision.

The CHAIRMAN: I am sure the meaning of the order of the House is that we should consider it.

Mr. WEST said he would leave that point, which, after all, was only a technical one. He thought it was the intention of the House that somebody should check the accounts and see that they were gone into and properly proved, whereas there would be no one to check them if his clients were excluded from the room. He would point out to the committee what the petition of the Chartered Company really was. He thought it unnecessary to go through the objects of the bill again, especially as they had been summed up clearly and well by the Board of Trade, who stated, "It is further to be observed, with respect to the Commercial Company, that the great main of the Chartered Company from their works at Beckton passes through and under the districts of the Commercial and Ratcliff companies, and the former seeks to construct new works."

The CHAIRMAN said he thought that statement in the letter of the Board of Trade made it incumbent upon the committee to consider, in the general public interest, whether it would be advantageous or not. But what the learned counsel was required to show was that he—not in the interest of the consumers, but in the interest of the Chartered Company—had a right to appear.

Mr. WEST said that was the object he had in view. It had been stated that the Chartered Company might still amalgamate with those two companies, under their present powers, after they had become amalgamated; but in that case there would have been a considerably increased amount of capital created, and new works erected, which might turn out to be utterly useless.

The CHAIRMAN: The only point upon which I want to be satisfied is this: You have the power by your Act to amalgamate; but it gives you no compulsory powers whatever; and the real point raised by Mr. Venables is whether you have a *locus standi*, because, taking your own side of the matter, the bill which is brought forward would put another company into the position that you would be less willing to buy them. Does that give you a *locus standi*?

Mr. WEST said that by the Act of 1868 it was forced upon the Chartered Company to give up their works in London and to buy 150 acres in the country for the purpose of supplying gas; and he should be able to show those powers were granted for the purpose of supplying a great number of companies which were to be amalgamated.

The CHAIRMAN: Your Act of 1868 only gave you the power of amalgamating with the City companies.

Mr. WEST said the Act of 1870 gave power to supply gas in bulk to all the other companies, to render new works unnecessary within the metropolis.

The CHAIRMAN: Taking it for granted that the Act of 1868 gave you power to supply gas in bulk, and upon that power you have put up your works at Beckton, will you show how that, in your opinion, brings you in? As I understand, your argument would go so far as this: If any one of the companies we see upon the map were to bring in a bill for additional works, or, in fact, for more capital, you would have a *locus standi* to appear against it?

Mr. WEST said not only should he contend that, but he should even go further. When the Imperial came for fresh powers in 1873 and sought amalgamation with the Commercial, they were thrown out upon the Chartered opposition, and the question of *locus standi* was not raised in that case. He (Mr. West) could not help thinking that the position of the Chartered Company was not understood. It had been asserted that they were advantaged by the Act of 1868, but on the contrary they had suffered severely, and they had only adopted that Act because they were obliged.

Mr. BRISTOWE: The allegation in your petition is that you have laid out your works with the view to the manufacture of gas on behalf of other companies. Now, inasmuch as the Acts under which you operate gave you power to do so by agreement with other companies, I wish you to show how that can give you a *locus standi* to appear, in consequence of your having erected those works of your own mere motion, without amalgamating with other parties.

Mr. WEST: My argument was to show that having the power to take those companies gives us a *locus standi*. What I am trying to contend for is, that if you take from me an option, or put the thing to be chosen by me at a higher price and in a different position from that in which it was at the time when I was given the parliamentary power to make that option, I should have thought it would have given me a *locus standi* to be heard. The argument may be a very bad one, and it may be shown that we have done very foolishly in laying those mains through the district with the hope of amalgamation. No doubt the enormous outlay has raised the price of gas to the consumers, but that is a matter of evidence, surely. It is alleged in our petition that not only have we this right, but that we have exercised it. We have absorbed, under the legislation of 1868, no less than five companies, and those absorptions have been for the benefit of the public, no doubt.

The CHAIRMAN: The question is, whether you ought to say that this bill interferes with you because you have built up works, whereas the reply might have been that you ought not to have built works contemplating an amalgamation with the Commercial Company until you knew that you were going to be amalgamated.

Mr. WEST: That may be the argument, but every company is bound by the Acts of Parliament as they exist, without anticipating any fresh Act.

The CHAIRMAN: There is no fresh Act required. The Act of Parliament gave you the power to amalgamate and to erect works at Beckton for amalgamation.

Mr. TALBOT: There is a further point in the amalgamation, that you have power to supply in bulk.

Mr. WEST: We have pipes and valves through the Commercial district to supply them in bulk.

Mr. BRASSEY: You have not supplied any other company with gas, have you?

Mr. WEST said he was told they had to the London Company, but that was matter of evidence. The Chartered Company had surely a perfect right to act upon existing legislation, and the fact that fresh legislation must take place before their position could be deteriorated was proved by the fact of the bill which had been introduced. If no legislation took place his clients would be satisfied, but if any new legislation took away from them the option, he (Mr. West) contended that clearly entitled them to be heard, if merely to show cause why they should not amalgamate, and why they should not increase the expenditure.

Mr. VENABLES, in reply, said there were two entirely distinct questions at issue: Had the Chartered Company *locus standi* against the amalgamation? or had they a *locus standi* against the new works, upon the ground that they could supply in bulk? It did not follow that because they had one power they had the other. His learned friend had broadly laid down that this power of amalgamation gave his company the right to oppose any bill brought forward for the purpose of improving the condition of any company in any part of London, because it might make them less willing to amalgamate. The only precedent given was the opposition of the Chartered Company to the Imperial Bill in 1873; but it appeared that, in the first instance, there was no objection to *locus standi*, and consequently the question was not raised. Did the promoters take away any power that the Chartered Company already possessed? Certainly not, and there was no *locus standi* against a bill where nothing was taken away. A voluntary power of agreement was no ground for *locus standi*. His learned friend had remarked that they had power to object to any company in the metropolis making additional works because that company might take their gas from Beckton; but that was putting it far too low. Under the 7th section of the Act of 1870 the Chartered Company were authorized to supply gas in bulk or lay down mains to connect with the mains of any other company outside the limits of the metropolis; and it therefore followed that if they had a *locus standi* on this point of supply against the Commercial Company, they would have equally a *locus standi* against gas companies all over the kingdom.

Mr. BIRLEY: Would you apply it to a district beyond the Metropolitan Board of Works limits, and say that the Chartered Company would have no *locus standi* to companies asking for power?

Mr. VENABLES: I should say they have not, and they would say they have. Therefore it is clear that if any gas company outside the metropolis came for new works, the Chartered which have just the same right of *locus standi* as they have against a company inside.

The CHAIRMAN said it was a clumsily framed clause, but he thought the meaning of it was the metropolitan district beyond the limits defined by the Act of 1868.

Mr. BRASSEY: It means beyond, but contiguous to.

Mr. VENABLES said it did not mean contiguous to. They claimed their *locus standi* against any company outside the metropolis, and no doubt according to the meaning of the Act, they could sell gas to any suburban company, and that was unobjectionable so long as it depended upon agreement. But, again, in that matter, did the promoters take away any power which the petitioners possessed? They had still a power of agreeing to sell gas to any one who would take it. If they had constructed works with the view of supplying companies who had not agreed to take it, they had done an improvident thing and must take the consequence.

The committee having consulted together,

The CHAIRMAN said they felt it was a matter of very considerable doubt, but it was one of those cases in which they ought to give the benefit of the doubt to the party claiming to be heard, because they were anxious not to shut out of consideration any claims that ought on good reason to have been

admitted. Taking that view, the committee could not refuse a *locus standi* to the Chartered Company, and they said that mainly on the ground that the Act of 1868 gave power to sell gas, and at the same time said it was expedient that the company should be empowered to purchase land for the erection of gas-works. It might be said it was their own fault if they erected works for a sale of gas larger than what they knew they would find purchasers for; but, at the same time, it might be admitted that they were, by that Act of Parliament, in some measure tempted to erect those works. On the other hand, the committee did not consider that they had any *locus standi* to oppose the amalgamation between the Commercial and Ratcliff Companies.

WEDNESDAY, JUNE 30.

Mr. *Richard Bradshaw*, examined by Mr. POPE.

I have been a director of the Commercial Company since 1864, and deputy chairman for the last two years. The company was originally formed in 1836, and was reconstructed under a deed of settlement, dated February, 1839. In 1847 the company were incorporated under their first Act of Parliament, and their capital fixed at £150,000 share capital, with power to borrow £50,000. In 1850 the company acquired the undertaking of the Poplar Gaslight Company, and in 1852 the London undertaking of the British Gaslight Company. Those two companies were both within one district, so that by those amalgamations we obtained the district to ourselves. By our Act of 1852 our Act of 1847 was repealed; but we then came under the Gas-Works Clauses Act of 1847. Our capital powers, as defined by the Act of 1852, were £450,000, inclusive of £50,000 borrowing powers. The company have since exercised all their powers, and also the power they possessed of converting the borrowed money into capital. The whole of the capital is entitled to a dividend of 10 per cent. We have not been to Parliament since 1852 for further powers; but of course we are under the Act of 1860. Prior to 1850 the company was anything but prosperous. I have understood that for several years there was no dividend, and we had some difficulty in meeting the wants of the district, and carrying on the undertaking. During the period of the company's greatest adversity, Mr. Butler, who was then member for the Tower Hamlets, took an interest in the undertaking, and devoted a great deal of time to its development. In 1854 Mr. Jones, our present engineer, also came on the staff of the establishment. By the assistance of those two gentlemen the necessary capital was raised, and additional works carried out, so as to improve the company's position, and enable them to meet the demand upon their resources. That improvement has since continued, and the company are now in a very prosperous state. Under our Act of 1852 we were not restricted to any maximum price, nor was any illuminating power fixed; but the general Act of 1860 not only settled those matters, but also defined our district, which extends from the Thames on the south side, to the parish of Hackney on the north, and from the river Lea on the east, to the City on the west, the parishes of Whitechapel and Ratcliff being lighted by the Ratcliff Company. The number of consumers the Commercial Company have on their books is nearly 18,000. The total capital on Jan. 1, 1861, was £314,985, and the difference between that amount and the £450,000 has been raised subsequently to 1860. By the Act of 1860 we were required to supply 12-candle gas at 4s. 6d., which might be increased to 5s. 6d.; but we have never charged the full 4s. 6d., nor have we ever confined our supply to an illuminating power so low as 12 candles. Our highest price has been 4s. 5d.; but since 1868 it has not been higher than 4s. The average of the illuminating power has been 15 candles, and we continued to supply that quality at 4s. during the coal famine. The price we are now charging is 3s. 9d. for 15-candle gas. We supply our consumers with meters free of charge, although we are entitled to charge 10 per cent. upon the cost. We are on the best of terms with all our customers. Our consumption has been increasing year by year for many years past, and our powers are now entirely exhausted; during last winter we had not a single retort out of action. It is therefore an absolute necessity to make some provision for increased production. Mr. Jones was instructed to investigate the matter, and he reported in favour of the site mentioned by Mr. Venables. We inspected the site, and agreed with him that it was very favourable in point of situation and in every other way. It is quite impossible to extend our existing works. Our new site is in the parish of Bromley, and has a large frontage to the river Lea; it is entirely within our own district. We had power under the Act of 1852 to purchase 20 acres of land; our present works measure about 11½ acres, and we have entered into a contract, conditional upon its receiving parliamentary sanction, to purchase 8½ acres more, making 20 acres, at a price of £40,000, or £2000 an acre, which I think is a very advantageous purchase. We propose to erect additional works at once. Our proposition is to spend £80,000 during the first two years, another £20,000 during the next two years, and another £20,000 during the following two years, making £120,000 in all, spread over six years. The new works will be productive as soon as completed. The following accounts have been prepared in compliance with the letter of the Board of Trade:—Statement showing additions to an application of reserve-fund since 1860; statement of share and loan capital created and raised, and how appropriated since 1860; statement of application of capital since 1860; and a statement in detail of capital expenditure. [Handed in.] We also ask for power to stop up a footpath skirting the bank of the river which intersects the site of the works, but there is a substituted road which is waiting the confirmation of the Quarter Sessions. The amount of additional capital we propose to raise is £560,000—half by shares and half by borrowing; the share capital to carry a dividend of 7 per cent., and the borrowed money not to exceed 5 per cent. Assuming the demand for the gas increases at the rate of 6 per cent. compound interest, which is the usual rate, that capital would last for about 12 years. We propose to come under the obligation to supply 16-candle gas at the maximum of 3s. 9d. Our bill as amended contains the clauses passed by the committee the other day, although there may be some modifications upon certain minor points. We propose to amalgamate with the Ratcliff Company, and I am of opinion that amalgamation will be beneficial to the consumers as well as to the companies. I think the two companies are perfectly on equal terms. I believe the amalgamation is acceptable to the consumers and to the local authorities of our district; it would also effect a saving which would be for the general benefit. The terms of amalgamation are those of perfect equality between the two companies. The Commercial Company are to take over the assets and undertaking of the Ratcliff Company, and assume all their debts and liabilities. The proprietors of both companies have approved of the agreement arrived at.

Mr. WEST was proceeding to cross-examine witness with reference to the capital of the company when he was interrupted by

Mr. POPE, who said there was not a single word in the petition of the Chartered Company with reference to accounts, capital, or finance of any kind, and he asked the committee to confine them to their petition.

Mr. WEST said he desired to show that it was unnecessary that any bill should be passed for the purpose of raising money and making new works, because his clients thought they could supply gas in bulk.

The CHAIRMAN: You will have to show us that there is a special allegation in your petition upon which you require this information.

Mr. WEST: I think paragraphs 27 and 28 refer to that: "The mains of your petitioners pass through the districts of the Commercial and Ratcliff Companies, and your petitioners submit that if either of those companies require an additional supply of gas they might obtain the same from your petitioners, and thereby save the expenditure of money contemplated by the said bill." I therefore think I have a right to go into the capital and see if that expenditure can be saved or not.

The CHAIRMAN said he thought Mr. Pope was rather premature in stopping the evidence, and Mr. West had better go on.

Cross-examined by Mr. WEST: Under our general Act we have £150,000 capital, with power to borrow £50,000 more. Under this bill our capital is proposed to be increased by £250,000, making a total of £450,000. Section 54 increases the total borrowing power from £50,000 to £80,000, but it does not increase the total capital of £450,000.

Mr. WEST: About this land which you think of purchasing—will you take in your hands Mr. Field's book?

Mr. POPE again objected. He said it was perfectly obvious that time was of importance, and if his learned friend could succeed in going into irrelevant topics he might consume an amount of time fatal to the measure, irrespective of its merits, and therefore he desired to confine the inquiry within the shortest possible limits.

Mr. WEST: In 1869 your charges for wear and tear were £4870, or 1s. 2d. per ton; in 1870 they jumped up to £15,648, or 3s. 9d. and a fraction per ton; in 1871 they fell to £10,660, or 2s. 5d. per ton; in 1872 they again fell to £5819, or 1s. 3d. per ton; and in 1873 they jumped up again to £23,492, or 5s. per ton. Can you tell us how it is that there is this great change?

Mr. POPE: I must object.

The CHAIRMAN: You must give us some notion how this is to bear upon the question of the land.

Mr. WEST: I am instructed that to this wear and tear account the company actually put the price of the land they have purchased.

Mr. POPE: That is a suggestion you have no right to make within your petition, or without any question as to it, because it has no bearing upon the necessity for acquiring the land.

The CHAIRMAN (to Mr. West): Are you instructed to state that the expenditure of money contemplated by the bill applies to money that has been already expended?

Mr. WEST: I am not only instructed to do it, but I hold in my hand a printed document showing it.

Mr. POPE said the only allegation the petitions were entitled to go into was, not that the money had been expended elsewhere, nor yet how it had been expended, but simply that the promoters need not construct works at all if they took their gas from the petitioners.

The CHAIRMAN (to Mr. West): You say, "If either of these companies require an additional supply of gas." You do not raise the question whether they require it, but you say, "If they require it" you can supply it, and prevent the outlay which they propose by their bill.

Mr. WEST: I should have thought I was entitled to show that they do not require it; and I also desire to show that in past years they charged to wear and tear the purchase of this land.

The CHAIRMAN: I am not at all saying that is a matter the committee ought not to go into, but it does not rest within the allegation of the paragraph in your petition, and if you proved it I do not see it would make any difference.

Mr. WEST: All I want to prove is, that for this purpose they have been for several years charging to revenue the very sums with which they purchased the land upon which they are going to raise new works, which we say are unnecessary, because we can supply them in bulk; and I can show from their own report that that is the course they have adopted.

Mr. BRISTOWE: You know that the object of petitions is to give information to the promoters of the points to be raised against their bill, and what would have been easier than to have put it forward in your petition if you intended to make it part of your case?

Mr. BRASSEY: You say they have charged to revenue what they ought to have charged to capital.

Mr. WEST: I should have said that the only way in which these inquiries can be maintained, as all other inquiries in courts of justice are maintained, is by allowing persons—selfishly, though it may be—to come in and go into the inquiry.

Mr. BIRLEY: You have to show us that, however well the Commercial Company may direct their works, and however economically they may supply gas, still the Chartered Company from Beckton can supply it cheaper than or as cheaply as the Commercial Company.

Cross-examination resumed: We have never asked the Chartered Company to supply us in bulk, nor yet the price at which they could do so. I am aware the company have a main passing through our district, and I have heard it is supplied with taps and valves ready to provide our district with gas. I am not aware that the Chartered Company have been supplying the London Company with gas in bulk, nor have we made any inquiry as to how the latter company obtained their gas.

Cross-examined by Mr. LITTLER: There are a great number of manufactories in the neighbourhood of our new works. To the west of the site the land is of a class where working people's houses are likely to be erected. The surrounding land belongs to the same owner.

Mr. LITTLER: You say there are a good many factories. Are you aware that those factories are under the control and inspection of the Poplar Board of Works, who have an inspector to see that they are so conducted as not to be a nuisance?

Witness: No doubt; most local boards have inspectors of nuisances.

Mr. LITTLER: Of course it is necessary you should have works somewhere. Have you attempted to obtain land in a less crowded district than this, or is it impossible to obtain it?

Witness: It is not impossible to get land elsewhere, but it is not possible to get a better site within our district. I inspected a site some years ago down the river, but there were difficulties in the way, and nothing came of it.

Cross-examined by Mr. O'HARA: Have you any objection to the insertion of a clause to the effect that you shall issue your loan and share capital *pari passu*. What I mean is, supposing you issue £70,000 of share capital under the bill, are you willing to submit to the restriction that you shall not issue any more shares until you have raised by borrowing a sum equal to £70,000?

Witness: Yes; I am willing to do that.

Mr. O'HARA: Have you likewise any objection to insert another clause to the effect that after the expenditure of the first £150,000 of capital raised either by shares or borrowing under the provisions of this Act you should get some public body—the Board of Trade, for instance—before you issued any further loan or share capital, to certify that the amount you desired to issue would be required during the ensuing 12 months, and allowing the Metropolitan Board to be heard before the person appointed by the Board of Trade?

Witness: I am not prepared to answer that question off-hand, but will give an answer before the inquiry terminates.

Re-examined by Mr. POPE: While we were charging 4s. the Chartered were charging 5s.

By the CHAIRMAN: We have had complaints from customers that they could not get enough gas—not hostile complaints, but information has been given that in some of the factories they would like more gas in the early hours of the morning.

The CHAIRMAN: Do you know whether the main which passes through your district could spare you any gas?

Witness: I only know what the chairman of the Chartered Company said about it at a Wharncliffe meeting on January 22 of the present year. They had a bill in Parliament this session which was thrown out on Standing Orders, and they called a meeting to ask the sanction of the shareholders for the raising of additional capital, and Mr. Beck said——

Mr. BROUGHTON objected to witness reading an extract from the JOURNAL OF GAS LIGHTING.

Mr. POPE said he would call for the half-yearly report for April, 1874, in which the same statement was made. [Report handed in.]

The CHAIRMAN: With reference to the item of wear and tear, there is a very considerable difference one year with another. What do you include under that item?

Witness: In some of those years some sums were included for enlarging, repairing, and improving the works. If we had the money, probably we should have charged some of those items to capital. The result of not doing so is that there is less capital upon which 10 per cent. has been obtained, and so far the consumers have received the benefit.

Mr. BRISTOWE: Are we distinctly to understand that as regards that money which has been applied in the way you have mentioned, you do not propose to repay it out of any moneys proposed to be raised by this bill?

Witness: No. We have paid for 11½ acres of land, which was charged under the section of the Act of Parliament for enlarging works, and paid out of revenue.

The CHAIRMAN: And you do not want to get it back?

Witness: No.

By Mr. BIRLEY: I have had many conversations with the engineer on the question of buying gas in bulk. I look at that subject in this way: By our own Act of Parliament we are under very stringent regulations to supply gas to all our customers, and the gas must be of a certain illuminating power and purity and delivered at a certain pressure. If we purchased gas in bulk from another company we should be quite at their mercy. We do not know what gas they would supply us with; and therefore it would be taking the whole control out of our hands, while we remained liable to the penalties. It is perfectly evident the Chartered Company could not supply us more economically than we can supply ourselves. As I understand, their works at Beckton are not sufficient to supply the demands of their own customers; they had a bill in Parliament this year for raising additional capital for the purpose of enlarging their works, and they have enlarged the Bow Common works. Our ground is completely filled up; it is not possible to put up another retort.

By Mr. TALBOT: The population of the Commercial district is about 390,000. Our new site is on an isolated piece of ground, and no detriment would be done to human habitations by the erection of our works. The nearest inhabited houses are at Canning Town.

The CHAIRMAN: The point on which I think we ought to be more informed is, why you apply for so much greater increase of capital than you see any means of using for the next six years.

Witness: The amount of capital will be in the discretion of the committee. We thought that amount would last us some 12 or 14 years; not more than that. The works would be so erected that they could be enlarged from time to time.

By Mr. BRASSEY: I think £150,000 would carry us on for the next six years, assuming the increase to be the same as it has been in the past.

By the CHAIRMAN: In 1874 our supply was 824 million cubic feet, and six years hence we reckon the supply would be 426 million feet additional. The last half-yearly report of the Chartered Company states that "the manufacture and general business of the company is proceeding satisfactorily, and calls for no special comment beyond the announcement of the fact that the increase in the consumption of gas in the company's district is proceeding at so rapid a rate as to render such an immediate extension of the works necessary, to keep pace with it. These additions to plant are the more imperatively required in consequence of the closing for manufacture of the Westminster and Blackfriars stations." I gather from that that they want the increase of their works to supply their own district.

The CHAIRMAN: But do you not know that they are so far increasing their works as that they would be able to supply not only their own district, but also other districts?

Witness: I know more from the report of what their chairman said, that if the works had been double the size, the customers would have been glad to have taken the gas.

Mr. O'HARA, on the part of the Poplar Local Board, said he had no objection to the amalgamation between the two companies.

Mr. PHILBRICK said there were peculiar circumstances connected with the two companies, which had determined the Board of Works not to oppose the amalgamation scheme.

Mr. *Thomas Morrison Fairclough*, examined by Mr. POPE.

The authorized capital of the Ratcliff Company is £100,000 share and £20,000 loan. The whole of the share capital has been raised, and £15,670 of the loan capital. We were authorized in 1823 to raise the capital now existing, and we have had no additional powers since. We have at present sufficient retort power, but our gasholder power is deficient. Our rate of increase has been about 6 per cent. to actual consumers. Our district is a populous one, and fully covered.

By the CHAIRMAN: We supply the docks, but they are not large consumers.

By Mr. TALBOT: Our works are in a very valuable position, on the river side, and we propose to continue them, even if the present bill is passed.

Mr. *Robert Jones*, examined by Mr. POPE.

I am a member of the Institution of Civil Engineers, and consulting engineer to several provincial gas companies. I have been engineer to the Commercial Gas Company since the early part of 1854. At that time the company possessed four manufacturing stations—at Bow, Millwall, Ratcliff, and Stepney. Under my advice some of those works were dismantled and abandoned, and the existing works constructed, with the happy result of considerable prosperity to the company. Whether the two companies are amalgamated or not, an extension of works is absolutely necessary for the purposes of the Commercial Company. We have reached our utmost limits in every respect except storeage, of which we have a little excess. Both the quality and price of our gas have been substantially satisfactory to the district. We have had no complaints since 1860 from any local authority whatever. I received instructions from the board to look about for a suitable site, and, after visiting Millwall and North Woolwich, the best site I could find was that upon the river Lea, which I recommended should be adopted. There is a good deal of vacant marsh land all round. I think there is a growing increase of houses towards that new site. The general character of the population thereabouts is working men, dock labourers, men engaged in the chemical works of the neighbourhood, and iron-works; they are altogether of that class. It is a district within which what may be called nuisance trades have been centered for years.

Mr. TALBOT: Is that to be considered an admission that gas-works are a nuisance?

Witness: No. We have found, generally speaking, people build immediately around us. In the neighbourhood of the Stepney works the School Board have built a very large school, and people have built houses up to the walls of the works. There is very little odour from gas-works, and we make very little smoke.

Examination resumed: We use oxide of iron for purifying, and therefore we have no sulphuretted hydrogen escaping from the works. Last year we were a good deal harassed to supply our district. We used every retort upon the works every day, and had not one in reserve in the place; but on Sundays we were able to accumulate a quantity of gas to tide us over the other portions of the week. The sale of gas by the Commercial in 1874 was 824 millions, and by the Ratcliff 196 millions, making 1020 millions for the two companies for the year. We propose to lay out our capital in this way, that taking the first year at 1,081,200,000, which will be an increase of 61,200,000, the increase on our second year would be 126,072,000; the third year, 194,836,000; the fourth year, 267,726,000; the fifth year, 344,499,000; and so on to the end. We should make in the sixth year an increase of more than 426,889,000 feet. The sum per 1000 feet that was paid for dividend last year for the Commercial was 1s. 0¾d.; and for the Ratcliff, 1s. 1d. After we have expended the £120,000, and increased to the extent we anticipate, we shall reduce that sum to 10½d.; that would be our object in working. In my judgment, I do not think it would be possible, even supposing the Chartered Company were able to supply, to purchase from them in bulk so advantageously as we could make gas ourselves. I have a table here showing what would have been the result if we had gone to the Chartered last year, when they were charging 5s. per 1000 feet. In that case they would not have given us the gas for a less sum than 4s. 10d. per 1000 cubic feet, whilst we were charging 4s. In supplying in bulk, the Chartered Company would allow us one-third of the 1s. 6d. which is required to pay their dividend; and, taking 2s. 3d. as the cost of the works, and 1s. 3d., the sum for distributing plant, then they could have allowed us 6d. Then taking the cost of distribution at 2d.; collection, ¼d.; bad debts, ¼d.; and leakage, 6d., making 1s. 2¾d., deducting which from 5s. would leave 3s. 9¼d. Adding to that our cost of delivery of 4½d.; our share of the expenses of distribution, collection, and bad debts, 2¾d., and leakage, 5¾d., that would make 1s. 0¾d., which added to the 3s. 9¼d. would make the lowest retail price 4s. 10d. That, of course, was an exceptional year, and there was an abnormal state of things. I have not made a similar calculation at present prices, but it would be the difference between what it takes us to pay our dividend and what it takes to pay theirs.

By the CHAIRMAN: We should have to charge about 4s. 1d. instead of 3s. 9d.

Examination resumed: I have been told the Chartered Company have only one main running through our district, but I believe it is proposed to put down a second. But with one main we find that we distribute about one-ninth of the whole of the gas we make in 24 hours in a single hour of the evening. Taking their make last winter at 10 million feet, they would have to distribute 1 million feet per hour in the evening. The main they have now, which is a 48-inch main, is capable only of delivering 500,000 feet, which is less than their own district will take. They are proposing to increase the manufacture there another 10 million feet per day, and therefore the new main they propose to lay down will be harassed in the same way as the present main, unless they adopt some mechanical appliances, which the next witness will describe more fully than I can.

By the CHAIRMAN: They are now increasing the Bow Common works for special purposes of supply in their own district.

Mr. BIRLEY: Could you not buy their works and let them make larger extensions at Beckton instead of your building new ones?

Witness: I should not like to propose it to my board. I am sure they cannot spare those works under any circumstances whatever, for I know they are increasing them to meet their own requirements.

Examination resumed: Speaking as an engineer, I am quite sure the Chartered Company are not in a position to supply us with gas in bulk without making special provision for it, and I think we could make the provision considerably better ourselves. But there are other matters to be considered. If we take their gas in bulk to the extent we should require it, I do not see there is anything to protect us either as to quality, quantity, pressure, or purity. We should, by taking gas in bulk, be saddled with all the responsibilities of their manufacture.

Mr. POPE: So that on the ground of economy, as well as convenience, you are opposed to the idea of taking gas from them in bulk?

Witness: Decidedly. I am sure it would be getting in the thin edge of the wedge leading to amalgamation; and it would be a disastrous thing to the consumers of our district to have anything to do with them, either by amalgamation or otherwise.

By the CHAIRMAN: I do not think we should have any security as to the gas being of the proper illuminating power, because we should have it tested at any hour of the day.

By Mr. BIRLEY: We could not keep it independent of our own supply.

Mr. POPE: Even supposing you had what lawyers call a remedy over against them, it would be inconvenient that you should be liable to a penalty which you have not the control of and means of avoiding?

Witness: Yes.

Examination continued: Our new works will not interfere in the slightest with the mains and pipes of the Chartered Company. The only increasing main we propose is to connect the works with our present system of mains. We had scarcely the means of supplying the factories at Millwall last winter, and, therefore, we should bring our mains down the street running into Blackwall, and connect it with Millwall, so as to give that part of the district a better supply; that is the only outlay, and it would not interfere with their mains. I have considered the provisions of the bill which has received the sanction of this committee as a general Act, and I do not see the slightest difficulty in our amalgamated company coming under those provisions, and satisfactorily discharging their obligations. When the decision of the committee was given I proposed that we should adopt the bill fully.

Cross-examined by Mr. LITTLER: I do not apprehend that we shall increase the nuisance at all in the district. I know for a fact that the principal parties living in the district have no objection to our works. We gave notice to every person within 300 yards, and not one has objected.

Mr. LITTLER: Will you allow me to suggest that we are here on behalf of the Poplar Board to take care of these people, so that it does not look very much as if they did like it?

Witness: I understand that question a little better than you. I am sure you will find that the person from whom we purchased this land, and who has the most interest of all the other parties, is quite agreeable to it; and we know also that people living within 300 or 400 yards do not object to it; in fact, they rather like it, as it will bring an increased rating to the parish of Bromley. I do not know that the gentleman from whom we are going to buy the land gave only £50,000 for 70 acres, but I do know it is a very eligible place for the Commercial Gas Company's works.

Cross-examined by Serjeant SARGOOD: We did not take any steps to see whether we could get gas in bulk from the Chartered before we determined to make it for ourselves.

Serjeant SARGOOD: You advise this committee that the Chartered Company could not this year sell you gas in bulk under 4s. 0½d.?

Witness: I do not know whether the Chartered Company would be willing to do it to get hold of us; but, taking our price as 3s. 9d., they could not afford to sell us gas at a sum which would enable us to sell at that price. I can conceive that the Chartered would sell to us at the price they are selling to everybody else, and that they would allow us a dividend upon the distributing plant.

Serjeant SARGOOD: The real question is, what it costs us to make, and what we can afford to sell it for in bulk. As you sell per 1000 feet yourself, what is the price you think we should be prepared to sell at per 1000 feet in bulk?

Witness: I should be entirely guided by the difference in the cost, the dividend, and the capital.

The CHAIRMAN: We want to know at what rate the Chartered Company would be able to supply you with gas at your storeage places, and be able to pay dividend to their shareholders in the same way as they do now?

Serjeant SARGOOD: We have got enormous works, with power to supply in bulk, in order that we may make a contract, in the terms of the Act of Parliament, to supply in bulk; and it would be a very advisable thing for us to do so at a very low price, quite irrespective of dividend, rather than to allow our works to remain unutilized; and, therefore, I want to know what the price is, and how the witness arrives at it. We do supply gas in bulk to the London Company at this moment. (To witness:) What is the lowest price at which

you anticipate the Chartered Company could have sold you gas per 1000 feet in bulk; have you invited them to name a price?

Witness: To the consumers burners, I take it, they would supply it at 3s. 2½d.

Serjeant SARGOOD: You have satisfied yourself that 3s. 2½d. was the lowest price at which they could possibly sell to you. First of all, you say that you have had no communication with the Chartered on the subject, and next you have made up your own mind that they could not sell at a price cheaper than you could make it. I now ask you to give me the lowest figure at which you believe they would have sold it to you if you had asked them.

Witness: I think they would charge us, as against 2s. 8½d., 3s. 2½d. to make up the dividend. I have not gone into their cost price at all. I have taken my own cost price, and then I have taken the difference of dividend.

Serjeant SARGOOD: With regard to the documents handed in, what do you say they prove that the Chartered must charge you?

Witness: Taking it from this basis of calculation—the price charged last year by the Chartered—they would have to charge us 3s. 9½d. I have relied on Mr. Field's books for some of the items. I know that those books only give the aggregate of all the results taken at all the districts combined, and including cannel gas as well as common gas.

Serjeant SARGOOD: Do you not think that, if the analysis of Mr. Field over the whole of the district gave you a price not palatable to you, it was just possible the expense of Beckton, confined to itself, might have given you a price which was less oppressive?

Witness: There would be some little difference, but the quantity of cannel coal gas is only 22 per cent. of the whole bulk.

Serjeant SARGOOD: Supposing your idea of the 3s. 9d. odd, which was confined to Mr. Field's experience, were brought down to 2s. 9d., would you think it a little or a great difference?

Witness: A very great difference; but my opinion is, that though Beckton might be somewhat better than the general average of Mr. Field's book, it would not have made a difference of 1d. in 1000.

Serjeant SARGOOD: You say buying in bulk would put you in the undesirable position that you would have no security against penalties. Would there have been any possible difficulty in our stipulating that, provided you took gas in bulk from the Chartered, they should give you an indemnity against all penalties you might incur in law under your own Act, by any breach of its privileges?

Witness: I do not know. It is a question that hangs upon whether I made the application or not.

Serjeant SARGOOD: Assuming that you have settled the price, and have been satisfied with it, what difficulty would there have been in their giving you an indemnity against the risk of penalties?

Witness: I will not assume anything. I have a conviction that they will not be able to sell gas to me in bulk so cheaply as I could make it myself, and, therefore, the other little provisoes you speak of never occurred to me. If I had felt that the Chartered Gas Company were able to make and sell gas to my company cheaper than I could make it myself, I have not the slightest doubt I should have gone to them to buy it in bulk, and all the other matters would have followed.

Serjeant SARGOOD: You suggest that our present main is insufficient, and that we are going to lay down another; would you be surprised to hear that that second main is laid down, and paid for, and charged with gas at this hour?

Witness: I am aware there is a main taken from your own 48-inch main from Beckton. These are my impressions; I have not run after your people.

Serjeant SARGOOD: I do not believe you know anything about the subject, only that you do not want to take the gas from the Chartered Company. When did you first make up your minds that you would like to have new works on this additional land?

Witness: For the last two or three years. I think the first purchase of land —11½ acres—was in the half year ending December, 1873, but I am not positive.

Mr. MICHAEL inquired if his learned friend was entitled to go into that question.

Serjeant SARGOOD said he was upon the question of selling gas in bulk. The promoters said that the Chartered Company could not afford to sell gas at a certain price, and therefore they must make it themselves; but he was going to show the hollowness of that statement, because they had made up their minds to manufacture for themselves long ago.

After some conversation,

Mr. BRISTOWE said the learned counsel must limit his questions to the cost of production of gas in the future.

Cross-examination resumed: We have agreed to give £15,000 for the 8½ acres of land if we obtain our bill. The proposed extension of works is needful to meet the requirements of both companies, but in what way the land would be treated I cannot say.

Serjeant SARGOOD: Your 20 acres being absorbed by the 11½ acres under the Act of 1852, and the 8½ which you now require parliamentary powers for, will you point out where the other 30 acres are which you ask power to take under the 6th clause of the bill?

Mr. MICHAEL objected to the question. The 30 acres were not for the purposes of manufacture.

The CHAIRMAN said he thought Serjeant Sargood had a right to find out what expenditure the bill contemplated, and then make his own argument from the details of that expenditure.

Witness: At present I have not the slightest idea where those 30 acres are to be obtained.

The CHAIRMAN: You have already planned the works you mean to build; will those works take up the whole of the 20 acres or not?

Witness: Not at present. The prospective works are only planned to cost £120,000, and for 400 million feet of gas increase; but, of course, we may extend much more rapidly.

The CHAIRMAN: You have come before us for a bill for obtaining a certain quantity of land and making certain works, but you ask for a larger amount of capital to meet further extensions. Would those further extensions, beyond the works you intend to raise within six years, require the purchase of additional land to the 20 acres?

Witness: No.

Serjeant SARGOOD: How much money are you asking for under this bill to enable you to buy the 50 acres?

Witness: I am not contemplating the purchase of 50 acres, because I am not aware that we shall require it. I have confined myself to the outlay upon the 20 acres. The other 30 acres I am prepared to give up.

Serjeant SARGOOD: Since 1852 down to the present time have you had any other land, or dealt with any other land, than that you are now working on at Stepney?

Mr. MICHAEL objected to the question.

The CHAIRMAN: I think you cannot pursue this examination further.

Mr. *Harry Edward Jones*, examined by Mr. MICHAEL.

I am a member of the Institution of Civil Engineers, and for the last six years have been engineer to the Ratcliff Gas Company. I am well acquainted with the works and the financial position of the company. The company have a surplus power in retorts and manufacturing plant equal to about 30 per cent. on what they are now making as a maximum in the depth of winter, but their gasholder storeage is slightly below the due proportion. The distributive plant is in very good condition, and I believe the same attaches to that of the Commercial Company. The two districts are conterminous and shut in, and the mains of both companies would assist each other, but not from one works. The Commercial Company are rather in a precarious position. They have not that reserve which, at the rate of 7 per cent. upon retorts, and that sort of things, we consider desirable. The Ratcliff Company have doubled their supply in about 12 years. The price charged has been 3s. 9d. for 14-candle gas since the end of 1871, and we earn the maximum dividend. The consumers within our district are perfectly satisfied with the supply of gas. I know the new site selected by the Commercial Company, and have come to the conclusion that it is an exceedingly good one, and well situated for supplementing the distributive mains of that company. It will be preferable to increasing their Stepney works, because they pour gas in at the other end of their distributive mains. If they produced at Stepney, they must enlarge the arterial mains; but, if the works are placed at the other end, the arterial mains are saved. The new site is close to a low neighbourhood, in which coke is much used for domestic purposes; but its chief recommendation, next to its water frontage, is the capital foundation that exists.

By the CHAIRMAN: They will be able to do with less arterial mains, because an extremely short artery from the other end of the mains will serve arteries from the original station.

The CHAIRMAN: It is upon that ground, I suppose, that there is an advantage in having more than one work in a district?

Witness: Undoubtedly, unless you get to such a small scale of manufacture as that supervision becomes an item in the estimate.

Examination resumed: I have seen the borings of the site, and there is a capital bed of gravel resting on the London clay, within a few feet of the surface, and this is a very important element in the matter, as bearing upon the cost of the site. If you have a bad foundation, such as is found by the side of the river, and such as I know was the case at Beckton, it doubles the cost of all your large buildings, and tanks, and so forth. The whole object of dividing the outlay into three portions, rather than spend £120,000 at once, is not to have a lot of idle plant bearing dividend and not contributing to the manufacture of gas. In six years the daily consumption of the two companies will be increased by 2,218,000 cubic feet. My estimate for the completed works to supply that quantity at the end of six years, taken out roughly at so much per million, for retort-houses, gasholders, and so forth, comes to £79,000; added to which there are certain figures which I had to get from the engineer of the Commercial, which is to be paid for the land, and new wall, and a short piece of main, and some working capital, bringing it up to nearly the same figure—£120,000. My estimate was made on the assumption that half the capital might be at 10 per cent., and half at 5 per cent.

Mr. MICHAEL: As to the 2,200,000 feet per day, how much would it represent of the total make in the year?

Witness: It would represent an annual sale of 427 million feet. That outlay would involve a charge for interest on capital of about £8000, at the rate contemplated by the bill as now deposited, which would involve a charge per 1000 feet on the gas made there of something like 4½d. for the interest on the manufacturing plant on the quantity of gas produced in the year. I have prepared a table showing the analyses of the cost of 1000 feet of gas for the year 1874.

The following table was handed in:—

Company.	Capital per 1000.	Price of Gas.	Coal and Working Expenses, less Residuals.	Profit per 1000.	Profit earned per Cent.	Reserve Fund.	Amount for Dividend and Interest.	Gas sold per Ton.
	s. d.	*s. d.*				£		
Commercial .	10 11	4 0	36·52	10·34	7·8	14,808	13·19	8·810
Ratcliff. . .	11 9	3 9	29·64	15·45	11·8	916	12·99	9·432
Average . .	11 4	..	33·08	..	9·8	..	13·09	..
Chartered . .	19·02	5 0	39·12	21·94	10·9	Nil.	17·85	8·830

An analysis of the working of the Commercial Company for 14 years, from 1861 to 1874, was also handed in, but no questions were asked upon it.

(*To be continued.*)

Legal Intelligence.

COURT OF CHANCERY.—TUESDAY, AUG. 3.

(*Before Vice-Chancellor* MALINS.)

HOPE *v.* ROMFORD LOCAL BOARD OF HEALTH.

Mr. LOCOCK WEBB, Q.C., and Mr. FRANCIS ROXBURG appeared for the plaintiff; Mr. GLASSE, Q.C., and Mr. WELLINGTON COOPER for the defendants.

This was a bill filed by Mr. William Hope of Parsloes, in the parish of Dagenham, Essex, a civil engineer, seeking for an injunction to restrain the defendants, their agents and workmen, from removing or selling, or allowing to be removed or sold, any of the sewage sediment in Old Church Field, Romford, or from damming up or allowing to remain dammed up the flow of sewage through the sewer in a meadow belonging to the board and in some fields belonging to a certain Mr. Vince, and from allowing the sewer at the two last-mentioned places to remain disconnected. The bill also prayed for the specific performance of an indenture of the 16th of May, 1870, made between the plaintiff and the board, and for an inquiry as to the sums of money realized by the sale of the sewage; and, lastly, as to the damage, if any, sustained by the plantiff.

Mr. WEBB said that prior to the year 1868 the defendants had constructed two intercepting sewers, which ran through Romford in a southerly direction, collecting in their course the several branches leading from the principal streets on either side, and which finally converged to the north of a tank-house at a place called Old Church. At this point of convergence the main outfall sewer commenced, and, passing through the tank-house, terminated at the pumping station, erected on a farm called Britton's Farm. From that tank-house the sewage was formerly discharged into the river Rom, flowing on the east of it. In 1868, however, the sewage system of Romford was so bad that an injunction was granted to restrain the defendants from discharging the sewage into the Rom; and they were consequently compelled to resort to other means of disposing of it. In 1869 they accordingly issued advertisements, addressed to "scientific agriculturists," for tenders from persons wishing to hire 120 acres of light land, which they had recently purchased for the reception of the sewage of the town. The plaintiff in consequence opened negotiation, the result of which was that he was let into the possession of Britton's farm, and a lease of it was subsequently executed to him by the defendants. It was dated the 16th of May, 1870, and was a demise by the defendants to the plaintiff—firstly, of all the sewage of the town of Romford, or such part thereof as should flow by gravitation into the outfall sewer, which then conducted the sewage into tanks or reservoirs constructed on the farm; and, secondly, of the farm lands and hereditaments therein described, and known as Britton's, or Breton's, with the appurtenances, from the 29th of September, 1869, for seven years, the plaintiff paying therefor in respect of the premises firstly demised the yearly rent of £600. It appeared that a considerable amount of litigation and some misunderstandings had since then arisen between the parties, the plaintiff complaining, on the one hand, of the acts done by the defendants, which he said were in breach of their contract with him, and prevented his enjoying all his rights under the lease; the defendants, on the other hand, con-

tending that the plaintiff was indebted to them for rent, and that they had in no way improperly interfered with the supply of sewage which they had leased to him. The end of all was the institution of this suit, the bill in which prayed a decree to enforce the due performance by the defendants of their contract together with other relief, and the costs of the suit.

The VICE-CHANCELLOR, after some discussion, ordered a reference of the case to be made to Sir. Joseph Bazalgette, for him to report whether the defendants works, as they now existed, were sufficient to deliver to the plaintiff all the sewage of the town of Romford, or such part thereof as would flow by gravitation into the outfall sewer which, on May 16, 1870, conducted the sewage into tanks or reservoirs constructed on the farm in the lease of that date mentioned; and, if not, whether anything, and what, ought to be done or left undone to give him such benefit. The costs of the motion were reserved, with liberty to apply.

YORKSHIRE SUMMER ASSIZES.

NORTH AND EAST RIDING DIVISION, YORK.—MONDAY, AUG. 2.
(Before Justice FIELD *and a Special Jury.)*

ACTION FOR ALLEGED WRONGFUL DISMISSAL OF A GAS MANAGER.
SUGDEN *v.* HOWDEN GAS COMPANY.

Mr. WADDY, Q.C., and Mr. DUGDALE appeared for the plaintiff; Mr. SEYMOUR, Q.C., and Mr. TENNANT for the defendants.

Mr. WADDY said this action was brought to recover damages for wrongful dismissal. The plaintiff, on the death of his father, who had previously held the post, was in May, 1870, appointed manager of the Howden Gas Company, being paid at the rate of 5 per cent. on the sales. Under his management the works were carried on successfully, and no complaint was brought against him until the 19th of June, 1873, when he received a letter from Mr. Geo. England, the secretary, enclosing a resolution of the directors, to the effect that the chairman having reported that the manager had, on the evening of the 10th inst., in the public street of Howden, used language insulting to him personally and the directors, and detrimental to the interests of the company, it was resolved that unless a satisfactory explanation were given, the secretary give him notice that his services would be dispensed with after the 30th inst. On the 24th the plaintiff replied by a letter, in which he denied that he had used language insulting to the other directors, or detrimental to the interests of the company. Whatever he said had had reference to the chairman only, and arose from his asking the latter when he made any complaint to make it before him (plaintiff) or to the directors, and not to the men. This explanation was not considered sufficient, and refusing to tender an apology, the defendant afterwards received an intimation that he had been dismissed. It was a fact, the learned counsel said, that Mr. Kettlewell had, behind the back of the manager, been talking to the men, finding fault about a large quantity of coals being on hand, and saying he ought to be made to pay for them. He mentioned that matter to plaintiff, and said it would be better for him to give up the position of manager, as there were better men who wanted it. Mr. Kettlewell was the very gentleman who ordered him to purchase the coal. The plaintiff attended the meeting of the board, and wished to ask the directors personally about the matter, but Mr. England came out and said he could not see them, but that the one question he was to answer was—would he apologize to Mr. Kettlewell? The plaintiff, considering himself the aggrieved party, would not do so, and on the 15th of July he received from the secretary a copy of a resolution declaring the explanation unsatisfactory, and the office of manager vacant; £25 salary was owing to him, but he could not tell how much commission until he put the company into court for both amounts, because he could not see the books. They, however, took the necessary steps to have the case tried at these assizes, and had paid the £25 into court.

The *plaintiff* was called in support of the statements of his counsel, and, in cross-examination, said Mr. Kettlewell met him one night, and complained about the large stock of coal at the works, and charged him with doing this in order to get commission. He told Mr. Kettlewell that if he had any complaints to make he had better make them to the directors. He did not, however, make use of offensive remarks, and he did not say, "Mind you don't find the works blown up some night." This remark, and the offensive expressions, were made, he believed, by his brother, and not by himself. At a meeting of the directors he did not admit to Mr. England, the secretary, that he had made use of the words, and justified himself on the ground that he was very much excited. The gas company did not sell or let out meters, but allowed him to do that. He got his meters as his father had done, and always ordered them in the company's name. He paid for them himself (which was not disputed), and the secretary and directors knew nothing about it, because he took the bills when they came in, and settled them. He received commission on them, but, as a matter of fact, he never received a halfpenny as commission upon the coals.

The plaintiff's brother corroborated plaintiff's statement that nothing at all offensive was said.

Mr. SEYMOUR, for the defence, justified the dismissal of the plaintiff on account of the offensive language he had used towards Mr. Kettlewell. He had also said, "Mind you don't have your works blown up to-night." What were the directors to do if they were thus treated by a servant? Give him opportunity to apologize or dismiss him. Plaintiff refused to apologize, though every opportunity was given to him, and they were, therefore, compelled to discharge him. Referring to the ordering of meters for himself as manager of the gas-works, the learned counsel said nothing could be more destructive of the trust which should exist between employer and employed.

Mr. *Kettlewell* denied ever having complained about plaintiff ordering too much coal, or that he had made complaints to the men on the works concerning the manager.

Mr. *England*, sen., a director of the company, said after plaintiff was discharged he did not render his account, and he (witness) wrote for it. He found that £46 was due to the company, but that was afterwards paid into the bank to the company's credit. The company received a bill from the firm, who had supplied the meters to plaintiff, for £21 for goods supplied to their manager.

In answer to Mr. DUGDALE, witness said the company had not suffered from the meter transaction, because plaintiff had paid the account.

His LORDSHIP observed that if an action had been brought the company could not have resisted it.

The jury eventually returned a verdict for the defendants.

WESTMINSTER POLICE COURT.—THURSDAY, AUG. 5.
(Before Mr. ARNOLD.)

CHARGE OF STEALING GAS.

Mr. *G. Sanderson*, proprietor of the Cadogan Hotel, Sloane Street, Chelsea, surrendered to his bail, charged on a warrant with stealing, between July, 1870, and July, 1875, 600,000 cubic feet of gas, the goods of the London Gas-light Company.

Mr. BESLEY, barrister (instructed by Mr. H. E. Browne), prosecuted, and Mr. GILL, for Mr. Montagu Williams (instructed by Mr. Child, of Sloane Street), defended.

The facts of the case were given in the last JOURNAL, and the following evidence was now taken:—

Mr. *Thomas D. Tully*, superintendent of the company, said they had supplied the defendant with gas at 75, Sloane Street, Chelsea. The contract produced was that signed by the defendant, and agreed to by him and the company. The defendant was only supplied with gas to 75, Sloane Street. No. 131, Pavilion Road, which the defendant also rented, ran parallel with the house in Sloane Street. On the 13th of July, at nine o'clock in the evening, he went, in consequence of information, to Pavilion Road, with Mr. Neighbour, his assistant. He observed a flap with an iron bar and a padlock; this was across the pavement. There were two entrances to the hotel, by Sloane Street and the side. He observed no opening or window except the cellar-flap. On the 19th of July witness went to the Sloane Square station with Mr. Larkin, the inspecter of the district at Sloane Square; met Mr. Larkin's fitter, the foreman lamplighter, and Mr. Neighbour. It was arranged that Mr. Neighbour and four of the workmen of the company should go to the Pavilion Road, and the rest of the party to the Sloane Street side; they went at twelve o'clock in the day. A card was given to the barmaid by Mr. Larkin, and she went towards the coffee-room of the hotel and returned almost directly. Witness waited ten minutes, and at the request of the inspector, one of the barmaids retired to communicate a message to the defendant, who came and looked over the bar; he did not come into the bar. Mr. Larkin then said to the defendant, "I wish to see the gas-meter;" defendant said, "Very well, you can go down." Witness went down into the cellar of the hotel with Mr. Larkin, where the meter was; in the cellar he saw the cellarman, who was at work at the beer pipes. He had lighted candles on sticks, as ordinarily used in vaults. Mr. Sanderson did not go down with them. He told the defendant he had a cellar in the Pavilion Road, and had the gas there. He made no direct answer. Witness then said he wanted to know if there was any communication between that cellar and the one in the Pavilion Road; he said, "Yes, there is; but it is difficult to get at. You will have to go through the coal cellar." Witness said to defendant, "I had better tell you that I have information that you are using gas in the cellar in the Pavilion Road, and it is my business to know how you get it; will you show me this communication?" He said, "Yes; take a light." Witness took a light, and while he was holding it Mr. Sanderson suddenly left his side and communicated something to the cellarman, who then left the cellar. Witness asked Mr. Sanderson to show him the coal cellar, and he showed him a pipe which he said led to his daughter's bedroom. Witness said that was not the pipe he wanted to see, and defendant pointed out another, which was a water-pipe. They made no progress towards any passage way, and at that moment the foreman of the service-layers came half way down the cellar steps and called out, "Mr. Tully, you are wanted in the Pavilion Road." Witness, with two of the company's servants and Mr. Sanderson, went along the side of the hotel and turned the corner into the Pavilion Road, and found the flap open, and the company's pipe (the street service), that formerly supplied the celler, had been disconnected, and to that service-pipe was attached a three-quarter tap and the apparatus now produced. The company's pipe was on the floor, immediately under the place where it had been fixed. He found cobwebs inside, and no spider would build in a pipe impregnated with gas, so it must have been there a very long time. (The apparatus consisted of about 17 feet of ½-inch india-rubber tubing, a ring with four fishtail burners on it, and a small thumb-tap.) The object of the tubing was to enable the burners to be shifted. It could not be used for domestic purposes. This was all examined in the presence of the defendant. There was no meter between the burners and the company's supply-pipe. The gas was not burning; the thumb-tap was turned off and the other tap turned on. The gas was lit in the presence of Mr. Sanderson; one burner could not be used alone, so the whole were lighted. Mr. Larkin was present all the time. Upon this discovery, Mr. Sanderson said to witness, "What does this mean?" Witness replied, "It means that the company are being robbed of their property." Defendant said, "Is there not a meter?" Witness replied, "Look for yourself; you see there is no meter here." He said, "What shall I do?" Witness replied that the board of directors would meet on Wednesday morning at 10.45, and he would recommend the defendant to see them, but he could not undertake to say that the board would see him. Witness gave instructions that the whole of the apparatus should be taken possession of, the gas should be cut off there, and he was not sure that it was not his duty to cut off the gas in the hotel also; but, in consideration of defendant's position in the neighbourhood, he would leave that for the instruction of his board. He also took the pipe that had been removed from the tap. When the apparatus was removed the gas escaped, and a new cap was put on in the street outside. Witness then went to the coffee-room of the hotel with the defendant, who, he said, had better meet the board if they would agree to an interview. Defendant then asked if he would be good enough to write down the address of the company's office, and the day and time of meeting, and witness did so. Defendant said, "What do you call it? what does it amount to?" Witness replied, "The last case I had similar to this was called felony, and it amounted to twelve months hard labour." Defendant said he would attend the board on Wednesday, and witness then left the premises. He had since had the burners tested at the lowest pressure in the main in the Pavilion Road; the day pressure was 10-10ths of an inch, and the night pressure 15-10ths. The four fishtail burners consumed at the rate of 14 feet per hour at the lowest pressure; at 15-10ths the consumption would be increased to about 21 cubic feet per hour. The reducing socket had been expressly provided to meet the size of the tubing, and it was not of the usual size or class. Witness reported the matter to the board, and they declined to meet defendant. He attended two meetings of the board, and they had not seen him.

By Mr. ARNOLD: Could not tell when the cap was put on by the company.

By Mr. BESLEY: No gas was supplied to any other part of the house in Pavilion Road, except in the cellar. As far as he knew, there was no communication between the cellars of the defendant in Sloane Street and those in the Pavilion Road.

By Mr. ARNOLD: The gas supplied to Pavilion Road came to that cellar direct from the Pavilion Road main, and that supplied to the hotel from the Sloane Street main.

Mr. GILL reserved cross-examination till Mr. Montagu Williams attended.

Mr. *William Neighbour*, assistant-superintendent to the company, said he went to the Pavilion Road on the 13th, also on the 19th, about half-past twelve. Mr. Tully and Mr. Larkin left him and four workmen at the Pavilion Road; at that time the cellar-flap was closed, and barred up and padlocked on one side. After he had waited half an hour at the corner of the road, he saw a man running towards Pavilion Road. Witness stood back, within five feet of the cellar-flap. The man had a coach-wrench in his hand, and he unpadlocked and unbarred the cellar, and removed the flap. He hurried down into the vault. Witness went into the cellar immediately afterwards. In the cellar opposite, witness saw the apparatus produced, connected with the gas company's pipe. Witness remained in the cellar till Mr. Tully and Mr. Sanderson came, and he lighted the four burners, and then turned them off again, to show there was gas up to that point. In the presence of Mr. Sanderson, witness said to the cellarman, "Where's the wrench you brought down just now?" and he produced it. It was an ordinary carriage-wrench, and it was such an instrument as could be used for unscrewing pipes of any kind. Mr. Sanderson saw the tool, he believed, but said nothing with regard to it. Witness left the cellar, and then the men were set to work to remove the things.

In reply to the magistrate, the witness said he saw the wrench on the pavement after the man had closed the flap; the cellarman brought it up and took it away.

The cross-examination of this witness was also reserved.

Mr. ARNOLD said, as the matter must be adjourned, they had better not take the evidence of Mr. Larkin then, as it would be long.

Mr. BESLEY assented.

Mrs. *Jane Martin* deposed that she occupied the house, 131, Pavilion Road, and rented it of Mr. Sanderson. There were four rooms and a cellar, which Mr. Sanderson occupied. There was no access to the cellar from the house, but only from the street by the trap. There was formerly a communication

between the cellar and house, but it had been long closed up. They had been tenants 12 months, and no gas had been supplied to the house. Had seen people from the hotel frequently come to the cellars, more often in the winter than summer; as near as she could say, about once a month. Witness had never been in the cellar. Had seen the gas burning in the winter, through the cracks in the stairs, in the evening time. Had noticed it going to bed, and as late as 9 or 10 o'clock; had not noticed it in the morning. Had never had any conversation with the defendant about it.

Mr. ARNOLD thought they might take a longer adjournment, if the defendant could find bail.

Mr. GILL said he was prepared with any amount of bail.

The case was then adjourned to Friday, the 13th inst., one surety in £200 being taken, as before, for defendant's appearance.

Miscellaneous News.

METROPOLIS GAS SUPPLY.

METROPOLITAN BOARD OF WORKS.—At the meeting of this board, on Friday last, a report was submitted from the Parliamentary Committee, recommending that the committee be instructed to consider, after the recess, the course to be taken with a view to legislation on the gas question next year, to confer with a committee of the corporation on the subject, and to report their recommendations to the board. On the motion of Mr. Newton, the report was adopted. A letter was read from the Imperial Gas Company, transmitting a cheque for £970 19s. 4d., certified by the taxing master to be due from the company to the board as their costs in connexion with the application of the company for a revision of the price of their gas in the year 1874.

METROPOLIS WATER SUPPLY.

The following are the returns of the Society of Medical Officers of Health on the composition and quality of the metropolitan waters in July, 1875:—

Names of Water Companies.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen.		Hardness.	
			As Nitrates, &c.	As Ammonia.	Before Boiling.	After Boiling.
Thames Water Companies.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	17·90	0·056	0·130	0·001	13·9	3·3
West Middlesex	17·51	0·034	0·136	0·000	13·4	3·0
Southwark and Vauxhall	17·36	0·051	0·132	0·001	13·4	3·0
Chelsea	17·83	0·043	0·104	0·001	13·8	3·3
Lambeth	18·07	0·057	0·141	0·001	13·9	3·3
Other Companies.						
Kent	28·07	0·004	0·340	0·000	20·9	5·8
New River	17·36	0·023	0·134	0·000	13·5	3·0
East London	17·33	0·040	0·136	0·001	13·6	3·3

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

The water was found to be clear and nearly colourless in all cases but the following, when it was slightly turbid—namely, in those of the Grand Junction and the Southwark and Vauxhall Companies. The average quantity of water supplied daily to the metropolis during the preceding month was, according to the returns of the water companies to the Society of Medical Officers of Health, 121,381,916 gallons; and the number of houses supplied was 518,127. This is at the rate of 36·9 gallons per head of the population daily. The last official return from Paris stated that the average daily supply per head of the population was 31·4 gallons; but this includes the water used for the public fountains, and for the ornamental waters in the Bois de Vincennes and the Bois de Boulogne.

HY. LETHEBY, M.B.

BRITISH ASSOCIATION OF GAS MANAGERS.

(*Continued from page* 75.)

[Lecture by Mr. A. VERNON HARCOURT, M.A., F.R.S., Lee's Reader of Chemistry at Christchurch, Oxford, and one of the Metropolitan Gas Referees.]

On the evening of Tuesday, the 8th of June, Mr. Harcourt delivered the following lecture before the members of the association, on

EXPERIMENTAL INQUIRIES CONCERNING THE PURIFICATION AND ILLUMINATING POWER OF COAL GAS.

I shall venture this evening to ask your attention to an account of a number of experiments upon which I have been engaged during the last six years, relating to one branch or another of the chemistry of your manufacture. Experimental inquiries, having a practical end in view, are, in one respect, far less satisfactory to the inquirer than purely scientific investigations. Every precise question addressed to nature receives a precise answer. If the question is a new one, the answer is a new truth, and cannot fail to have some scientific value. But when the question is, whether a much-desired result can be attained by a particular way, an affirmative and a negative answer are by no means equally welcome. And the more pains the inquirer has taken to put his question clearly, the greater risk does he run of having his hopes suddenly destroyed by an abrupt and unmistakable "No."

Much of the work which I have done has yielded no practical result. Over this I shall pass quickly. Your time must not be wasted as I fear some of mine has been. But where the result or mode of inquiry seems of any scientific interest, I shall mention it; and where the path which I have explored, and have found not to lead to the object sought for, still seems tempting and delusive, I may do good service by writing up "No road."

I have not brought with me an apparatus which I designed for the estimation of sulphur in gas. It is figured in the Proceedings of this association for 1870. It gave very good and constant results. I tested the thoroughness of the absorption and conversion into sulphuric acid of the oxides of sulphur formed from the burning gas, by substituting for the jet of gas a stream of carbonic acid, which passed through a dilute solution of sulphurous acid. I found that the amount of barium sulphate obtained corresponded to the amount of sulphurous acid volatilized, the latter quantity being ascertained by measuring the strength of the sulphurous acid before and after the experiment with a standard solution of iodine. The washing liquid I employed was an ammoniacal solution of copper sulphate. If sulphurous acid is mixed with ammonia solution, and exposed to the air, sulphate of ammonia is formed very slowly; but if a few grains of copper sulphate are dissolved in the ammonia, the change takes place rapidly. Salts of manganese produce the same effect, not in ammoniacal, but in neutral or acid solutions. I tried washing the products of combustion of the gas with a neutral manganese solution, hoping thus to ascertain the amount of sulphur in the gas by determining volumetrically the sulphuric acid formed; but the results were always lower than when ammonia was used. Since my apparatus was worked by an aspirator, I was able to attach two of them together, and, burning gas only in the first, to wash the products of combustion twice over. The liquid drawn from the second apparatus scarcely contained a trace of sulphuric acid. But when, a few months later, I obtained the sulphur test of the late gas referees, I found that it gave results quite as good as I obtained with my apparatus; and, as it had the advantage of requiring no aspirator, I have always used it since. With moderate care on the part of the operator, it is an excellent instrument. The tubulure at the base of the cylinder is sometimes too small inside, and irregularly welted on the outside. The former defect is, perhaps, the cause of the yellow or brown colour sometimes seen in the liquid formed, which is a sign that the combustion of the gas has been imperfect. The latter defect is apt to cause an escape of part of the products of combustion between the tubulure and caoutchouc tubing. If the burner gives a luminous flame, this may be remedied by beating down gently the tin nozzle through which the gas enters, and piercing it afresh with a smaller hole. I have, however, tried the effect of enlarging this opening, so as to produce a luminous flame, making, at the same time, a comparative experiment with a second apparatus, whose flame was non-luminous; the liquid formed was as colourless, and the amount of sulphur found as great in the one case as in the other. I am about to bring under your notice another apparatus which I have devised for the estimation of sulphur; but, as its action depends on certain chemical facts, which I am also endeavouring to turn to account for the purification of gas, I shall give an account first of some trials of different methods of purification.

When ammonia is added to a dilute solution of iron persulphate, the precipitate of "oxide" which is formed is one which slight agitation of the liquid will keep in perfect suspension. The thin broth thus constituted absorbs sulphuretted hydrogen readily, and may be revivified by exposure to the air. I have it here in its oxidized, and here in its sulphurized condition.

At the Oxford Gas-Works I set up a small scrubber, consisting of a succession of perforated wooden trays. The lower half was enclosed and traversed by the gas to be purified; the upper half had a covering, which admitted the air. The suspended oxide was pumped round and round, and trickled down through air, in the first part of its course, and then through "foul" gas. The plan failed, because revivification does not proceed rapidly enough with suspended oxide. Sulphuretted hydrogen dissolves pretty readily in water, especially in water containing ammonia, and thus acts on the oxide suspended in it; but oxygen dissolves very sparingly, and thus the oxide, or rather sulphide of iron, cannot get it as quickly as it needs. In the open air it inhales oxygen, and becomes warm and revivifies: but under water it is drowned.

When "spent" oxide—which is, in fact, oxide enriched by the addition of an equal weight of a material more valuable than itself—is mixed with dilute sulphuric acid, the oxide dissolves, and sulphur remains mixed with whatever impurities insoluble in acid the original oxide contained, and with a small quantity of Prussian blue, and probably some other substances, formed in the purifiers. If the dissolved oxide, or iron persulphate, is poured over the dry oxide, and thus returned to the purifiers, and if the gas entering the purifiers contains ammonia, a double decomposition, as it is called, takes place; the ammonia is fixed as sulphate, and the oxide is restored to its original condition.

Upon these facts is based a system of treating the oxide used in purification, which has been partially tried by a friend of mine in this neighbourhood, and which appears to me worthy of your attention. In the first place I carry condensation and scrubbing no further than is necessary to free the gas from tar, so as to send the ammonia as far as possible on into the purifiers. Here it is arrested and accumulates as sulphate of ammonia, just as it does in purifiers charged with copperas. Whenever the oxide is taken out of the purifiers, it is watered with solution of iron persulphate, by which means each particle, when exposed to the action of ammonia, becomes coated with freshly-formed oxide, and the whole charge is maintained at a maximum of efficiency. To keep up an absolutely continuous action, it is necessary to extract, from time to time, from portions of the oxide in use, the accumulated sulphur and sulphate of ammonia, and also to make solution of iron persulphate with which to water the remainder. All that is required is to wash a portion of the oxide first with water and then with dilute sulphuric acid. The watery extract is a solution of sulphate of ammonia; the acid extract is the solution of iron persulphate, with which the oxide on the revivifying floor is watered; the undissolved residue is sulphur, together with the impurities of the original oxide, which are thus gradually eliminated, and some Prussian blue which can be easily separated by a process I will show you directly.

This diagram shows the manner in which the extraction of sulphur and sulphate of ammonia is conducted at the small gas-works of Burley-in-Wharfedale, and I have here specimens of the products obtained—namely, crude sulphur, sulphate of ammonia, and iron liquor, *i.e.*, solution of iron persulphate. Both the crude sulphur and the sulphate of ammonia contain cyanogen compounds. I have attempted to find methods of separating these compounds in a form in which they may be of use, instead of being injurious as sulphocyanide is when mixed with sulphate of ammonia.

I have here a solution of iron perchloride. I pour a few drops into this cylinder, and add a similar quantity of potassium ferrocyanide. You see the production of Prussian blue. I add ammonia—the colour vanishes, and the liquid becomes slightly muddy with a precipitate of iron peroxide. The Prussian blue has been decomposed; soluble ammonium ferrocyanide and insoluble iron peroxide have been formed. On filtering, therefore, the two would be separated; and if the cylinder had contained sulphur as well as Prussian blue, the insoluble sulphur would remain with the iron peroxide on the filter. But the iron is now in a condition in which, though insoluble in water, it dissolves very readily in an acid, and can therefore be separated thus from sulphur.

I have in this flask some of the crude sulphur mixed with Prussian blue made at the Burley Gas-Works. I pour dilute ammonia over it and shake the two together. Next I add some hot water, because hot water washes better and filters more quickly than cold. I pour off the liquid through a filter, wash again with hot water to remove the ammonium ferrocyanide which has been formed, and pour upon the residue, which is now a mixture of sulphur and iron peroxide, some dilute sulphuric acid and some more hot water. This dissolves the iron without affecting the sulphur. I filter, and the iron passes through in solution. Lastly, I bring together the two liquids, and the original Prussian blue—whose constituent parts, the ferrocyanide and the iron, have been thus separately extracted—is formed again. Here is some of the mixture I started with, of sulphur and Prussian blue; here is the sulphur, and here is the Prussian blue.

Next, as to the separation of sulphocyanide from sulphate of ammonia. When sulphate of ammonia is formed in the purifiers, and extracted by washing with water, the extract contains some quantity of sulphocyanide. When it is concentrated by evaporation, sulphate of ammonia crystallizes out, and the mother liquor contains a large proportion of sulphocyanide. The same result may be obtained by systematic washing of successive portions of oxide with the same liquor. The sulphocyanide becomes concentrated in the first washing, and the subsequent washings contain sulphate comparatively free from sulphocyanide.

When a liquid containing both ammonium sulphocyanide and sulphate is mixed with a small quantity of copper sulphate and sulphuric acid, and allowed to stand for a short time over clippings or other scraps of copper, the sulphocyanide is wholly removed from solution, being precipitated as a white powder—cuprous sulphocyanide. Here is a specimen of this substance prepared at Burley. The excess of copper may be separated from the liquid drained off, and the sulphuric acid neutralized by adding a small quantity of ammoniacal liquor, after which evaporation yields pure sulphate of ammonia. Since it is not difficult to obtain, by processes the description of which would carry me too far, potassium ferrocyanide and copper sulphate from cuprous sulpho-

cyanide, the gas manufacturer should exchange at an advantage with the chemical manufacturer his accumulations of cuprous sulphocyanide for the copper and copper sulphate he would need.

An alternative process for freeing sulphate of ammonia from sulphocyanide, and realizing the cyanogen compound, consists in distilling the solution with sulphuric acid and manganese peroxide. Hydrocyanic acid distils over, and may be collected in dilute ammonia. The distillate is mixed with enough solution of iron sulphate (green vitriol) to neutralize the ammonia, and heated to boiling. The operation, though not a long one, requires more time than I can bestow upon it now; but I have here the apparatus I have used for the distillation, and here the product of mixing the ammoniacal distillate with iron sulphate. I can show you the last operation, which consists in mixing this product with dilute sulphuric acid. Prussian blue is precipitated, and a solution of iron sulphate is formed ready for the repetition of the process. The residue, from which the hydrogen cyanide has been distilled, consists of a solution of sulphate of ammonia, mixed with manganese sulphate, and whatever excess was taken of sulphuric acid and manganese peroxide. By neutralizing it with ammoniacal liquor, the acid is neutralized and the manganese precipitated. The liquid drawn off and evaporated yields nearly pure sulphate of ammonia. The residue, when dried, can be set on fire and burnt, yielding manganese peroxide ready for the repetition of the process.

I am sorry time does not permit me to demonstrate the steps of this process before you, but each of them has been carefully verified in my laboratory.*

I pass now to experiments having for their object the discovery of a method for reducing the amount of sulphur in clean gas.

The preparation I hold here is one of the first I tried. The chief difficulty in the way of obtaining constant results when purifying with sulphide of calcium is, it is now well understood, the action of carbonic acid upon the purifying material. Carbon bisulphide will combine with many other sulphides besides that of calcium, and several of these differ from calcium sulphide in not being decomposed by carbonic acid. It was only, of course, those members of this class which could be obtained in large quantities at a moderate price which it was worth while to try. The most suitable seemed to be zinc, and accordingly I prepared some zinc sulphide, of which this is a part, by mixing zinc sulphate with half its weight of powdered coal, and heating the mixture to redness in a crucible. The product was placed in a tubulated cylinder, and gas passed through it to the sulphur test. The volume of purifying material used in this and in some 500 similar experiments which I have made with different materials, was measured so that the experiments might be made to scale. One cubic foot of purifying capacity per 1000 cubic feet of gas per day, which is Mr. G. Anderson's liberal allowance, corresponds to 20·74 cubic inches for ·5 cubic foot per hour. In various experiments I have used either 5, 10, or 20 cubic inches of the material experimented with. I have sometimes employed two or more long tubes of half an inch diameter, so that the gas might pass, as it would in a purifying-box, through two or three feet of material, instead of passing, as it would with a tube of this form, through a less depth at a less velocity. I do not find, however, that this makes much, if any, difference in the purifying effect of a given bulk of material; and the inference from this seems an important one. It is that the gain in reduction of pressure effected by having purifiers of large area with a comparatively small depth of material in them is attended by no loss in regard to the purifying effect. I started with the impression that force exerted in impelling the gas through the purifying material would have the advantage of producing a more thorough interaction by the collisions and friction which must occur between the gas and solid; but I do not find this to be the case. I am not comparing, remember, the effect of driving gas quickly or slowly through a given depth of material, in which case it is obvious that the slow current gives the advantage of a more prolonged contact. The time of contact is the same when 100 cubic feet of gas are sent through one cubic foot of material in one hour, whether that material is spread in a layer of one foot in depth over a square area of 100 feet, or is heaped up in one or more layers, amounting to 10 feet in depth, on an area of 10 square feet.

I ventured to remark at your meeting last year, that some confusion seemed to arise from the different modes in which different speakers stated the relation of their purifiers to their make of gas. Some gave the total capacity of the boxes, some the total area of the boxes, some the total area of the shelves. I wish to submit to you, with due deference, that the statement should be of the ratio which the bulk of gas transmitted in a given time bears to the bulk of the material through which it passes. This ratio is independent, and so, I believe, is the purifying effect, of the actual size of the boxes and the number of shelves. Perhaps the best units to employ would be to state the number of cubic feet of lime or oxide in use at one time per 1000 cubic feet of gas per hour.

But to return to laboratory experiments: 20 cubic inches of this material—an excessive quantity, I admit—corresponding to 23 cubic feet per 1000 cubic feet of gas per hour, reduced the sulphur from 28 grains to 1·6 grain in 100 cubic feet. A second portion of gas passed through the same material contained 2·8 grains. The material taken out, reheated, and replaced, reduced the sulphur to 1·4 grain. A second preparation gave the same result. The coal heated by itself reduced the sulphur from 23 to 12 grains, the zinc sulphate heated by itself to 17 grains. Powdered blende had no action, nor had zinc sulphide prepared by precipitation either when damp or dry. I found out at last that the main effect —I doubt now whether the whole effect—was due to the product, not of the action of the coal on the zinc sulphate, but of the zinc sulphate on the coal. Coal heated with iron sulphate, or with iron oxide, or with manganese oxide, or in a current of steam, or in a current of air, gave a similar result. None of those preparations continued to act on the gas for any length of time, and I discovered at last, what you will probably have anticipated, that the effect was due to the porosity of coal thus treated. By reheating any of these products, their activity was restored, but they gave off a vapour when heated which burnt with a luminous flame, showing that bisulphide was not the only carbon compound they had absorbed. It would be possible to distil off these vapours from the absorbent material, and having thus, as it were, come to close quarters with the bisulphide, to separate it and restore the hydrocarbons to the gas. But it is not possible economically; the bulk of absorbent material required for a given volume of gas is too large.

It was worth trying whether gas containing ammonia would not be purified more persistently; it seemed likely that carbon bisulphide and ammonia, absorbed and so compressed into the same pores, might act on one another; but either they do not react, or the pores are soon clogged by the products of the reaction. I observed one fact of interest as regards the action of lime. To ensure the absence of sulphuretted hydrogen, I always passed the gas through a second tube, containing either oxide or lime, as well as through the material with which I was experimenting; and I always found the result four or five grains lower, though the gas was perfectly clean, when I used lime than when I used oxide. And this was not only the case when the experimental material produced little effect, but also with the material which produced the maximum effect. With lime I have had results as low as ·8 grain of sulphur in 100 cubic feet, the same material with oxide giving five or six grains. I know the danger of hasty inference; but, to borrow the cautious language of a recent judgment, I am of opinion that there is reason to believe that gas contains a small quantity of some sulphur compound, other than sulphuretted hydrogen, which lime arrests, and which, not being absorbable by porous materials, is probably more volatile than carbon bisulphide.*

On reviewing my experiments on purifying materials, I must own that they appear to me less conclusive than, in the negative sense, I supposed them to be. If gas contained only one sulphur compound besides sulphuretted hydrogen, such trials of the effect of different materials would be comparatively simple. But, as it is, one material may stop 20 grains of sulphur out of 30, and another 10; and the conclusion that one acts better than the other may be a very insufficient conclusion, the fact being that each acts in a different way and on a different substance, and that the thing needed, but probably never tried, is their joint action. It is clearer now than it was three years ago, that gas should first be passed through foul lime and clean lime to remove carbon bisulphide, and whatever compound lime removes, and then through the experimental material to try its effect upon the residual sulphur compounds.

Before entering upon the course of experiments of which I have given an account—brief for their number, but, I fear, long for your patience—I had made many experiments on the effect of heating gas. I deserted this method, because it never brought the sulphur lower than six or seven grains per 100 cubic feet, and because it is less simple and inexpensive than would be the use of a material which could be used after oxide, and without risk of nuisance, if such a material could be discovered. When my attempts at the discovery had failed, I returned to the method of heating gas, to which I will now direct your attention.

Berthelot discovered that, when carbon bisulphide and hydrogen sulphide are passed together over heated copper, cuprous sulphide and marsh gas are formed. In attempting to turn this reaction to account, I observed, what others had observed before, though I was unaware of it, that clean gas became foul on being heated. This is now so well known that I need not illustrate it before you. You know that, if I were to pass gas through a tube heated as this tube is, sulphuretted hydrogen would appear at the outlet, though none could be detected in the gas before entering the tube. I found further that, whatever the tube was filled with, whether lime, which Mr. Bowditch proposed to use, or anything else, or if the tube was empty and carefully cleaned, the same effect was produced. But the amount of sulphuretted hydrogen, formed from the same volume of the same sample of gas in the same time, varied greatly, according as the tube was empty, or filled with any material presenting to the gas a large extent of heated surface. I am disposed to think that contact with a heated surface is necessary to the chemical change, though it takes place simply between two ingredients of the gas, and though the surface be that of a substance incapable, as far as we know, of acting upon the gas in any way. The lowest temperature at which I have observed this change to take place is just 400° Fahr. The observation was made by passing gas, at a slow rate, through a ½-inch glass tube, filled with small iron nails; the tube was enclosed in an air bath, the temperature of which, indicated by a thermometer whose bulb touched the glass tube, was raised very gradually until a piece of lead paper, placed in a narrow tube through which the gas issued, began to darken.

The two ingredients of coal gas, between which the change takes place, are carbon bisulphide and hydrogen, and not, as has been supposed, carbon bisulphide and water. I will give my reasons for thinking so. Gas, at the ordinary temperature—saturated, as, from its mode of storeage, it must be, with the vapour of water—contains about 40 times as great a volume of this vapour as it does, on the average, of the vapour of carbon bisulphide, or 20 times the quantity which would be needed to react with the carbon bisulphide. Thus far, therefore, without any addition of steam, the change on heating gas might be due to the action of aqueous vapour. But, in the first place, if gas is thoroughly dried, and passed through a heated tube, sulphuretted hydrogen is formed; and, in the second place, if a gas which does not contain hydrogen as an ingredient, but does contain both the vapour of water and that of carbon bisulphide, is passed through a similar tube, sulphuretted hydrogen is not formed.

I have here a glass tube filled with fragments of porcelain, and heated to low redness, through which hydrogen is passing, after having first been dried by going through a washing-bottle containing strong sulphuric acid, and a U-tube charged with pumice steeped in the same liquid. The gas passes up through this cylinder, and has at present no action on lead paper. This small tube, with a long capillary end, holds some carbon bisulphide. I place it so that its capillary opening is in the tube through which the hydrogen is passing. The vapour will diffuse out in small quantities and mix itself with the hydrogen. Observe the effect on the lead paper. Here we have, not as with coal gas a mixture of many substances, but only two—hydrogen and carbon bisulphide —and these two, in contact with nothing but glass and porcelain, produce sulphuretted hydrogen. Now I have substituted a gasholder, filled with nitrogen, for this hydrogen apparatus, and a bottle and pumice tube, charged with water, for the sulphuric acid used to dry the gas, and I find, all other conditions being alike, that no sulphuretted hydrogen is produced.†

All, however, that is of importance to a method of purifying gas by heating it, is the well-established fact that when it is heated, the carbon bisulphide in it is converted into easily-removeable sulphuretted hydrogen. This granted, there are some further questions to be answered. 1. Can gas be heated and cooled again in such a manner that the expense of the operation will not be too great? 2. Does the heat injure the illuminating power of the gas? 3. Is the effect of the heated surfaces with which the gas is brought into contact an enduring one?

First, by effecting an exchange of heat between the gas which has passed through the heating apparatus and that which is coming to it, it should be practicable to heat a large body of gas with a very small expenditure of fuel. To devise suitable arrangements for this purpose, on the scale on which alone the experiment could have an economical value, was a problem for an engineer, and the erection of such an apparatus was a costly affair. I had the good fortune to obtain the assistance of the foremost engineer and the greatest scientific authority in matters of this kind, Dr. C. W. Siemens; and the further good fortune to obtain the consent of the three metropolitan companies (towards whom I stand in an official relation by no means calculated to gain me their favour), to incur jointly the necessary expenditure. This diagram shows the construction of the "heater" erected last autumn

* The above process, so far as it consists in the conversion of sulphocyanide by oxidation into hydrogen cyanide, was suggested to me by Hadow's paper "On the Action of Oxidizing Agents on Sulphocyanides." (*Journ. Chem. Soc.*, vol. xi., p. 176.) As he states, the yield of hydrogen cyanide is somewhat greater when nitric acid is used than when the oxidation is effected by means of sulphuric acid and manganese peroxide. But not only is a large excess of nitric acid necessary where the proportion of sulphocyanide is small, but the nitrous acid acts upon the sulphate of ammonia, and a most uneconomical formation of nitrogen takes place. The solution I have worked with contained forty parts of sulphate of ammonia to one of sulphocyanide. The reactions with nitric acid are—

(1) $(H_4N)\,CNS + 3\,HNO_3 + H_2O = (H_4N)\,HSO_4 + 3\,HNO_2 + HCN.$

(2) $2\,HNO_2 + (H_4N)_2\,SO_4 = H_2SO_4 + 4\,H_2O + 2\,N_2.$

I have verified the first by determining the amount of sulphate formed, and the second by measuring the volume of nitrogen.

* This gas is most likely carbon oxysulphide, COS, which is decomposed by hydrated alkalies, forming carbonate and sulphide.

† The following experiment is perhaps still more conclusive:—A piece of combustion-tube was sealed at one end, and bent into the form of a V. The closed limb was half filled, partly with carbon bisulphide, and partly with water. Then the other limb was half filled with a solution of arsenic trioxide in dilute sulphuric acid, by holding the V inverted, and, after warming the tube, dipping the open end, which had been drawn out to a capillary point, into the liquid. When a sufficient quantity had entered, the point was withdrawn and sealed. The bend of the tube was thus filled with the vapour of water and carbon bisulphide, mixed with a little air. To increase the tension of the vapours, the limb containing the two liquids was again warmed, and the bend was then heated nearly to redness. No arsenic sulphide was precipitated in the opposite limb, showing that the action $CS_2 + 2\,H_2O = CO_2 + 2\,H_2S$ had not taken place.

at the Horseferry Road Works of the Chartered Company. As could not but happen with a new and experimental apparatus, its use has revealed various defects, which are, I believe, being remedied by degrees in this apparatus, and could be avoided in constructing a second one. The cast-iron plates which receive the ends of the tubes cracked in one or two places, and some further leakage occurred at the joints. A graver defect has been that though the tubes and the walls of the empty chamber through which the gas passes become strongly heated, the extent of heated surface is not sufficient to produce the required change in the gas. Instead of reducing the 30 grains of sulphur present in 100 cubic feet of the original gas to 10 grains, it has only reduced them to 20 grains. That this imperfect result was due to the cause I name is certain, for the following reason:—During the two or three weeks in which the heater (as I term it) was in operation this spring, I kept passing a small portion of the same gas through a flask filled with pebbles, such as I hold in my hand. The flask and its contents were heated over a ring gas-burner, and the gas which had passed through it was effectually purified. The upper chamber of the heater has now been filled with pebbles, so that the gas may be exposed to a larger heating surface. In a few days I expect to have it in operation again, and I hope then that the engineering problem will prove to have been solved, and that the heater will show itself capable of dealing as effectually with 10,000 cubic feet of gas an hour as this flask is of dealing with one or two cubic feet an hour.*

Secondly, as to the effect of the heating upon the illuminating power of the gas. I have repeatedly analysed samples of the gas taken before and after the heating. There is no appreciable effect upon its composition. I have made scores of observations upon the illuminating power both with the candle photometer and with the jet photometer, a far superior instrument for the purpose of such a comparison, and I can find no difference whatever. It is doubtless possible to injure the illuminating power of gas by exposing it to a sufficiently high temperature for a sufficient time; but it must be to a temperature much higher, and with a rate of transmission much lower, than is necessary or desirable for the destruction of carbon bisulphide.

Thirdly, is the effect of the heated surfaces an enduring one? Here are the results of an experiment in which gas was passed for two months through a heated flask filled with pebbles, and then through a small cylinder filled with oxide, a comparative sulphur-testing of the gas before entering the flask and the gas after leaving the oxide being made almost daily:—

Date.	Grains of Sulphur per 100 Cubic Feet. Heated Gas.	Unheated Gas.
Nov. 10	7·7	25·5
,, 12	7·9	20·7
,, 16	8·5	26·1
,, 18	9·2	26·4
,, 20	8·8	23·5
,, 23	7·5	24·0
,, 25	7·7	26·3
,, 27	7·7	24·0
,, 30	7·8	24·1
Dec. 2	8·0	26·8
,, 4	7·5	31·6
,, 7	8·7	29·8
,, 9	8·8	30·3
,, 12	8·9	35·6
,, 14	9·2	38·5
,, 16	8·2	29·0
,, 18	8·2	37·0
,, 28	8·3	30·2
Jan. 9	7·9	35·2

* I was the more anxious to make this experiment because the large apparatus, tried at Horseferry Road works, gave pretty good results for about a week, and then gradually declined in its effect; and because I thought the cause of this might be an overheating of the upper part of the apparatus. I tried the effect of heating the flask more strongly after it had been working successfully for a month; but it made no difference, and I see no reason to doubt that the pebbles in the flask would act in the same way for a much longer time than two months. By degrees a fine adherent coat of carbon is deposited on the pebbles. I have never known this make any difference, but if it should do so, it can be removed either on the small scale, or by an arrangement designed by Dr. Siemens to provide for this eventuality, on the large scale, by diverting the gas for a few hours, and drawing air through the heated material. This has been done both with the flask and in the large apparatus, with the result of restoring all the surfaces absolutely to their original condition.

Supposing all the mechanical difficulties of heating a large volume of gas and cooling it again economically to have been solved, the advantage which the process appears to me to possess over foul lime purification are—first, that as oxide may be used to do all the work of removing sulphur, the sulphur is not wasted as it is when lime is used; secondly, that the results are more uniform, and there need be no fear of a sudden increase in the amount of sulphur in the gas; thirdly, that the nuisance which, however successfully some gas managers may cope with the difficulty, is liable to arise in emptying foul lime purifiers is avoided.

[Mr. Harcourt has published a fly-leaf containing instructions for the use of his bisulphide test. We purpose, with the assent of the author, to print those instructions in our next number, together with a drawing of the apparatus.—ED. J. G. L.]

I pass now to a minor application of the process of heating gas. Every gas manager knows and uses the action of sulphuretted hydrogen on salts of lead, and is accustomed to judge whether a purifier is very or only a little foul by observing how long a piece of lead paper needs to be held in a stream of gas before a brown colour appears. I can tell roughly whether my small heater here is doing its work properly by holding a piece of paper at the outlet. If, instead of using paper, I pass the gas through a solution of lead, I obtain a similar brown tint, but as in this case the tint is uniform through the mixing of the liquid, and the action of the gas, if it does not pass too quickly, is complete, I can judge much better of the amount of effect produced. And by adopting a standard tint, and observing how much gas must pass through the liquid before that tint is produced, we can estimate pretty exactly how much sulphuretted hydrogen any sample of gas contains; and since all the carbon bisulphide contained in clean gas can be converted into sulphuretted hydrogen by heating the gas, we can equally tell by applying this test to heated gas how much carbon bisulphide the original gas contained. I will now set the apparatus to work.

When the tint produced matches the standard, it remains to read off the volume of water which has run from the aspirator into the measuring cylinder, and that gives the volume of gas from which a known quantity of sulphur has been got. For I can tell, by running a dilute solution of sulphuretted hydrogen of known strength into the lead solution, so as to make up in all this volume, how much sulphuretted hydrogen, and therefore how much sulphur, combined with lead, will impart this tint to this volume of liquid.

Leaving now the subject of purification from sulphur, I pass to another point on which I have made some experiments—namely, the estimation and utilization of ammoniacal liquor. I read half a year ago a controversy in the JOURNAL OF GAS LIGHTING, on the specific gravity of the standard acid used for estimating the strength of ammoniacal liquor, and I made a careful determination of its specific gravity. Dilute sulphuric acid, containing one gram of the pure acid in 10 cubic centimetres of the dilute acid, or, what is the same thing, 1 lb. of the pure acid in one gallon of the dilute acid, has, at the temperature of 60° Fahr., the specific gravity 1·0643. It would take too long to give you the particulars of the mode in which I prepared dilute acid of exactly the right strength, and determined its specific gravity at the right temperature; but I believe the result is trustworthy. As to the name of the acid, nothing can be better than that which Mr. Livesey proposed, of pound-to-the-gallon acid. If a liquor which will neutralize just its own volume of the standard acid is to be called 16-oz. liquor, meaning that a gallon of the liquor will neutralize 16 oz. by weight of pure sulphuric acid—as to which, I believe, all are agreed—the gallon of standard acid must contain 16 oz. by weight, or 1 lb., of pure acid. If I had the standard acid to prepare, I should not trouble myself about the specific gravity of the strong acid, but should pour one measure of strong acid into 15 measures of water, and let it cool; then I should take its specific gravity with the hydrometer, and should add more water to the dilute acid, until it was reduced to 1·0643.

It has often been pointed out that the gas manufacturer who sells his liquor as containing only so much ammonia as is shown when it is neutralized directly with the standard acid, does himself a great injustice. By boiling the liquor with lime the chemical manufacturer gets out of it much more than this.

I have here a small porcelain basin, over which a porcelain crucible is supported upon a wire triangle, standing on a ground-glass plate, and covered by a bell-glass. Into the basin I put a measure of standard acid, and into the crucible, first, a lump of quick lime, and then a measure of ammoniacal liquor, quickly replacing the bell-glass. By to-morrow morning the whole of the ammonia will have transferred itself from the liquor to the standard acid.

The following tables give some results I have recently obtained with two samples of liquor—one a quantity which has stood for a year or more in a closed carboy, the other fresh from the Oxford Gas-Works:—

Mode of Estimation.	Value in Ounces. Old Liquor.	Fresh Liquor.
1. Direct neutralization	6·5	9·0
2. Distillation from lime	9·7	11·9
3. Evaporation from lime under bell-glass	9·5	11·8

The third mode of estimating the value of the liquor is one which I would recommend, as being less troublesome and less liable to error than distillation, and giving almost exactly the same result.

The advantage of some form of Coffey's still for the manufacture of ammonium sulphate is well known; but there is a chemical reason, in addition to the mechanical saving of heat, which makes it especially advantageous for this manufacture. It is that if ammoniacal liquor is run directly upon lime, a much larger quantity of lime must be employed than if the liquor is first exposed to a current of steam, or still better, steam and air; since, as Mr. Hills has shown, the carbonic acid and sulphuretted hydrogen are thus driven out of the gas, and only so much lime needs to be added as will combine with the non-volatile acids, and liberate the ammonia fixed by them.

I have here a diagram representing an apparatus of this kind, which has yielded very good results on a small scale.

I have left scanty time for the remarks I wished to make on an attempt to retain hydrocarbon vapours in gas by slow condensation, and on some points of photometry.

I have often heard the remark that quick condensation injures the illuminating power of gas. I have also, in witnessing the operation of tar distilling, been struck by the quantity of highly volatile and luminiferous naphtha which has been removed from gas by condensation. Hence I was desirous of trying whether the illuminating power of gas might not be increased by condensing very slowly.

For this purpose I proposed—and Mr. G. Livesey was good enough to make the experiment for me—passing crude gas into a condenser of large relative capacity, and of the following construction. Three gasholders were made, such that the second could be placed over the first, and the third over the second, leaving a few inches space between each pair; their height was about 10 feet, and their diameter about the same. Gas, drawn from a point as near as possible to the hydraulic main, was led by a 2-inch pipe up to the centre of the innermost holder; through a number of holes near the bottom it passed into the second, and thence, through an opening near the top, into the outermost. A second series of holes, opening into a circular channel, was provided for the outlet of the gas, which was passed through at the rate of 1000 cubic feet an hour. Service-pipes from the outlet of this condenser, and from the condenser of the works, brought samples of gas, which thus differed, in the rate and mode of their condensation, to a pair of small purifiers and jet photometers.

The object of having three holders arranged in the manner described was that the innermost might be completely shielded from the cooling of the external air by being surrounded by warm gas. Thus the gas in its interior remained almost without loss of heat, in the condition which seemed most favourable for the settling of precipitated vapours, and the separation of the less volatile vapours from the more volatile. The final cooling of the gas took place as it flowed down the sides of the outer holder.

I feel confident that, through the excellence of Mr. G. Livesey's arrangements, the experiment was made in the most thorough manner; but the effect on the illuminating power of the gas was *nil*.

This result led me to consider more closely what would be the effect on the illuminating power of the gas if all that is now obtained from tar, in the forms of "crude benzole," "solvent naphtha," and "burning naphtha," could be retained in the gas. One thousand gallons of tar do not yield more than 20 gallons of naphtha in these forms. For every 10,000 cubic feet of gas there is formed about 12½ gallons of tar, or a quarter of a gallon of naphtha. Hence the total weight of naphtha available for increasing the illuminating power of gas is about 1¾ grain for each cubic foot, a quantity too small to have any appreciable effect.

Two or three attempts have been made at different times to estimate the illuminating power of gas by observing the proportion of air whose admixture would cause the gas to burn with a non-luminous flame. I have recently made a number of experiments on this subject, passing air and gas separately through two meters into a twisted tube, so that the two should be thoroughly mixed before reaching the burner at the end. The tube was fixed in a box similar to that of a jet photometer, with a long-handled stopcock on each side to regulate exactly the quantities of gas and air. Besides common gas, I tested various samples prepared so as to have different degrees of illuminating power. I found that the quantity of air required to produce a non-luminous flame increased with the illuminating power of the sample of gas, and in a sufficient degree to serve as a photometric test; but the proportion is not independent of the size of the flame or the diameter of the burner. This test, therefore, would be liable to the same defect as the candle photometer and the jet photometer, of depending upon the exact form of the burner, and is less direct than the former instrument and less simple and delicate than the latter. No method of estimating the illuminating power of gas can be entirely satisfactory in which the illuminating power of the gas is inferred from any other property or from the composition of the gas, and is not directly tested.

The acknowledged imperfection of the standard now in use, and the controversies which have arisen as to the proper burner for testing gas, render it

* *Note added July* 20.—The hope here expressed has not been fulfilled. The front plates were injured by the fire, causing a considerable leakage. In consequence the experiment has been discontinued.

highly desirable that a more exact standard should be adopted, and one with which the burner to be employed should be a matter of little or no importance. Such a standard, I believe, may be found in a mixture of hydrogen and petroleum vapour, which can be readily prepared, and at small cost, in sufficient quantity for this purpose. It is well known that the separation of the various hydrocarbons which constitute petroleum by fractional distillation is an impossibility. But it is not difficult to obtain a portion which boils below 180° Fahr., and volatilizes readily and completely in a current of hydrogen, forming gas of an illuminating power of 16 or more candles, according to the proportion adopted between the weight or volume of petroleum, taken and the volume of gas made. The constitution of hydride of amyl and the homologous hydrocarbons, which form the lighter part of petroleum, is such, that a given weight of a mixture of them contains very nearly the same weight of carbon, whichever hydrocarbon predominates. And as the decomposition of the hydrocarbons seems to be a condition of the luminosity of their flame, it appears likely that the illuminating power of a mixture of hydrogen and such hydrocarbons will depend upon the total weight of carbon in the mixed gas, and be independent of slight variations in the proportion of the different hydrocarbons.

I am at present engaged with experiments on this question, and hope soon to be in possession of a receipt for making 5 or 6 cubic feet of gas of constant illuminating power, which shall correspond, as far as an exact standard can be assimilated to an inexact standard, with 16-candle gas. If such a gas can be readily made and used, it has, apart from the question of constancy, one great advantage over standard candles or standard lamps—namely, that it can be burnt in the same manner as the gas whose illuminating power is to be measured by it. Whatever burners are used, provided they are similar, the result of a comparison would probably be the same, and by reversing the burners in two successive testings, a perfectly fair comparison would be secured.

I have now given you some account of nearly all the experimental work which I have attempted in connexion with your manufacture, and it remains for me to thank you for the attention with which you have listened to me.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The quietude reported as having pervaded almost every branch of the iron trade proper for some months past still continues, and is unlikely to be broken through, if one may give credence to the opinions of some of the oldest members of the local trade.

Pig iron continues to accumulate, and to cheapen somewhat. It is highly probable that some furnaces will shortly be blown out in order to bring the production down to the point at which the demand would appear to equal it. Agents are now quoting general makers brands of Cleveland pigs at about the following figures:—No. 1 foundry, 55s.; No. 2 foundry, 51s. 6d.; No. 3 foundry, 49s.; No. 4 foundry, 48s.; No. 4 forge, grey, 47s.; No. 5 forge, mottled, 46s. 6d.; No. 6 forge, white, 46s.; refined metal, 67s.; Kentledge, 55s.; and cinder pigs, 40s. to 41s. per ton for net cash. These rates are easier than those of last week, and can still be "shaded" by buyers of good parcels. Hematite pig irons are quiet, at the figures recently quoted. Merchant irons are in very poor request, there having been, however, no official intimation of any reduction in local prices for the past two or three months. It had been supposed that the Staffordshire lead might have been imitated here, but up to now no indication to that effect has appeared. Lowmoor iron is £22 per ton; good bars, £9 10s. to £10; medium, £8 15s. to £9; and common, £8 to £8 5s.

The York Gas Company has declared a dividend of 10 per cent., and the York Water Company 7 per cent. The dividend of the Sheepbridge Coal and Iron Company for the past year is at the rate of 15 per cent., as against 22½ per cent. last year.

There is literally nothing doing in the coal trade. Prices are weak and yielding. The coalowners again met at Sheffield, last Monday, and resolved to make an immediate reduction in the miners wages throughout the district, the amount to be arranged with the executive of the South Yorkshire Miners Association.

IRON AND COAL TRADES OF SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE.

(FROM OUR OWN CORRESPONDENT.)

A slight improvement has taken place in the condition of the iron trade of this district on the settlement of the wages question, and although the actual transactions have not been of important extent, the general tone of business is decidedly healthier than last reported, and makers are now more hopeful of a steady return of trade to something like its normal condition. Of course, the reduction in the wages scale, amounting to 6d. per ton only, on puddlers wages, and 5 per cent. on mill-men's, will not afford any material relief to the ironmasters, but inasmuch as it establishes a uniform standard of wages between the North of England and South Staffordshire, and precludes the possibility of any further dispute in respect to the scale of pay for six months to come, it has naturally had a beneficial effect upon the trade. It is stated that there are certain circumstances which at present render a uniform scale for the North of England and South Staffordshire unfair to the latter district, but the masters have undertaken to investigate the matter, and to remove any inequalities they may find to prevail.

Sheets, both plain and galvanized, continue to be the leading feature of inquiry, and hoops are in steadier request, prices are tolerably firm on the basis of £8 per ton for unmarked bars. Branded iron is still quoted £10 to £10 12s. 6d. for bars, and though some of the makers report themselves well supplied with orders, it is well known that there is yet nothing like activity in any department of the trade.

The pig iron market is weaker, notwithstanding that the demand is fairly steady, the large importation of iron from other centres of production is seriously interfering with local makers, and it is expected that some of the furnaces will be blown out. Common cinder pig is quoted £2 15s. per ton; and Staffordshire pig of good medium quality, £4 5s. per ton; hot-blast native all-mine, £4 15s.; and cold-blast ditto, £6.

The wrought tube and fitting trades of Wednesbury are slowly recovering from the recent depression, though the competition of rival makers in the United States continues rather severe.

The coal trade is without alteration, a slightly improved demand may be reported for best qualities; but it is in abundant supply, and prices are rather easy.

THE COAL AND IRON TRADES OF LANCASHIRE.

(FROM OUR OWN CORRESPONDENT.)

The supplies of coal in the market continue very much in excess of the demand, and there is no regularity in prices; indeed, it is very difficult to get what may be termed a fixed rate in any of the large coal-producing districts. Stocks generally are increasing considerably, notwithstanding the restricted output, the only exception being in the engine classes of fuel, such as slack and common burgy, which arises from less coal being screened, and in these descriptions of fuel there is in some quarters rather a scarcity. Although nominally the list rates are generally without alteration, there is a good deal of competition for orders, but buyers are simply purchasing from hand to mouth, in the anticipation of a still easier market. In the Wigan district a small reduction has been made in furnace coal, the pit prices for which now range as low as 7s. 6d. per ton.

The gas coal trade is quiet, and in the West Lancashire district some of the colliery proprietors have secured comparatively few contracts, which may be accounted for from the fact that consumers who have hitherto covered their requirements in Lancashire have apparently been able to place their orders on better terms in the Newcastle and other districts.

The shipping trade continues dull; here also the competition of other districts has been felt, and some of the collieries in the immediate neighbourhood of Liverpool have been partially closed. Prices are very low, and supplies are plentiful.

The coke trade is quiet, and the West Yorkshire makers, who produce a better article than is made in Lancashire, have been competing so successfully in this market, that it is not improbable some of the orders in the neighbourhood of Manchester may be put out. Prices are weaker, and good orders would be freely taken at a reduction of 2s. per ton upon the nominal rates, which are about 12s. per ton for small, and 20s. per ton for large cokes at the ovens.

The iron trade is without any improvement, and prices generally are easier. The Lancashire makers of pig iron have found it necessary to give way, but they have not made sufficient concession to secure the command of the market, as Yorkshire and Cleveland iron is being offered here at very considerably under the local quotations. The finished iron trade is also dull, but there is no material alteration upon late prices.

The local iron-works are securing very few new orders, and it is the exception to find them running full time. The Bolton engineering trade is unsettled by an agitation amongst the men for an advance of wages, and this has led to a strike at one of the works.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

As the nights begin to lengthen, and the autumn begins to steal on a pace, the gas coal trade begins to show some symptoms of improvement. The prices of gas coals have a somewhat long range. They may be stated at from 8s. 6d. up to 11s. per ton. One or two favoured collieries, which have a reputation in the market, may approach the highest quotations at times; but the business that is transacted as a rule is done at from 8s. to 9s. 6d. and 10s. per ton. There are a considerable variety of prices for second-class coals. As a rule, the pits engaged in this latter trade are not very well employed, and business with them is very dull. Household coals are without much change; but they are getting somewhat firmer, as the weather is cold and unseasonable. Steam coals are in moderate inquiry; and the principal business transacted for steam coals is in second-class sorts, which are sold at about 13s. per ton. Manufacturing coals are not much inquired after.

In consequence of the prevailing winds being from the north-east, light coasters have been kept back, and there have been a good few orders on hand, which, for want of shipping, have not been completed. Coasting rates have advanced, and until there is a change of wind, it is quite probable they will have an upward tendency. Freights to the Baltic for steamers and sailing ships have been lower, and there has been very little business doing to the Mediterranean. As the price of corn in the British markets has fallen fully 5s. a quarter, the demand for steamers which was anticipated would be largely employed in carrying corn from abroad to make the deficiency in our harvest has not been realized. Freights therefore will, no doubt, remain at their present moderate figure during the remainder of the year.

Prices remain pretty much about the same in the Cleveland iron market. There have been fair shipments of pig iron for Germany, the Baltic, and Belgium. There appears to be no hope of prices rising for some time to come. Everything indicates a dull state of trade in the Cleveland district. The general manufacturing trade of the North of England is pretty much in the same condition as the iron trade. There is very little doing, and there is no disposition shown to enter upon fresh engagements.

The Sunderland Town Council, at their fortnightly meeting held last week, adopted a recommendation of the Finance Committee to authorize them to enter upon negotiations for the purchase of the gas and water companies, and to take steps to obtain an Act of Parliament for the purpose if necessary. The council have entered upon a somewhat large subject, and it is very problematical that their negotiations will come to much.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The price of gas has been reduced by the Dysart Gaslight Company from 9s. 2d. to 7s. 6d. per 1000 cubic feet. In Kirkcaldy, however, from which the outlying villages of the royalty not more than half a mile from Dysart are supplied with gas, the price is only 5s. Thus the difference of 2s. 6d. per 1000 cubic feet is still very surprising, and much dissatisfaction is being expressed by the consumers who have to pay the higher rate.

In the burgh of Johnstone, which is only two or three miles from Paisley, the price of gas, even though it has just been reduced 1s. per 1000 feet, is still quoted at 6s. 3d., as against 4s. 2d., which is to be the price in Paisley in two or three months. The attempt which was made some months ago to float a new gas company in Johnstone has, for the present, fallen into abeyance.

On Saturday, the 31st ult., a meeting of the directors of the Keith Gas Company was held, when the annual financial statement was laid on the table. Unlike last year, when there was a decided loss rather than a dividend to the company, the balance this year is such as to warrant the directors recommending a dividend of 10 per cent., and reducing the price of gas from 11s. 10d. to 10s. per 1000 cubic feet, a reduction which, doubtless, will meet with public approbation.

The unequal incidences in the price of gas throughout Scotland are exciting a good deal of attention, and a strong feeling is arising that there are some peculiar caprices indulged in by gas companies, in respect of the price of the commodity which they sell, that cannot be accounted for by the facilities with which they can secure their coal, which is the chief item of cost. I have just mentioned 10s. as the reduced price at Keith, which is in Banffshire, far north, and far away from the nearest gas coal supply; but at Skelmorlie, on the Clyde, a few miles below Greenock, and easily reached by the railway which passes through Greenock, the price is 11s. 8d. per 1000 cubic feet. Referring to the price at Skelmorlie, a correspondent says:—"We are compelled to smile and be pleasant under such an extortion, in case we are left in utter darkness for our temerity in resenting such a charge."

The Forfar Gas Commissioners had their "outing" last week, but it has been attended with such a tragic result that a feeling of the utmost indignation has been aroused. They had an excursion to Dundee, and on the Tay they paid a visit to the training ship *Mars*, from which they were sent ashore by the commanding officer in two boats rowed by the boys. Through the improper conduct of the commissioners on board, one of the boys was drowned. Admiral Maitland-Dougall has written a most indignant letter on the callous behaviour of the commissioners; the Procurator-Fiscal of Forfar has examined them on the subject of the accident, and the people of the town are wrathfully aggrieved at their fair fame being involved by the conduct of their municipal governors. There is a serious proposal made to call upon them to resign their positions at the council board.

No time is to be lost by the Water Commissioners of Inverness in getting their water supply works extended, in accordance with the provisions of the Act passed during the present session of Parliament. They are in the market asking for tenders for about 1100 tons of 9-inch and 12-inch cast-iron pipes,

including branches, bends, and special castings. They are also advertising for contractors to execute the necessary works.

Tenders are also wanted by the Glasgow Corporation Water Committee for the laying and jointing of 3650 yards of 48-inch pipes, to form an additional line of syphon-pipes across the valley of the Endrick, on the line of the aqueduct from Loch Katrine.

The manufacturers on the Leven [not Severn, as given last week], in Fifeshire, want water greatly, and they are speaking of taking powers to raise Loch Leven two feet, at an expenditure of £25,000, so as to provide the necessary water storeage.

At an adjourned meeting of the Parochial Board of Drainie, in Morayshire, held a few days ago, it was resolved to form the villages of Lossiemouth, Branderburgh, and Stotfield into special water districts, in terms of a requisition from a large number of the inhabitants, and on the recommendation of the Board of Supervision.

In consequence of the Dalkeith water supply being now deficient, an attempt has recently been made on the part of the local authority, to increase it by bringing a supplementary supply from the Vogrie estate; but that has been refused, and the Water Committee have been instructed to apply to the Edinburgh Water Trustees.

Water has also become very scarce in the town of Hamilton, owing to the great deficiency of the rainfall during the present year. A few days ago the water in the reservoir was reduced to 10 ft. 5 in., while at this time last year it stood at 13 ft. 1 in., and in 1865 at 11 ft. 9 in. The town has been put on "short commons," the mains being shut off from nine o'clock at night till the same hour in the morning.

An important extension of the water-works at Helensburgh has just been completed, and the event was publicly celebrated last Saturday. The cost of the original works was rather more than £13,000, and that of the recent extension is rather under £3000. There will now be a constant supply of never less than 200,000 gallons per day. The piping is capable of carrying 1,000,000 gallons per day.

The Airdrie and Coatbridge Water Company have likewise just completed some important additions to their supply works, the chief of which is a new filter 121 ft. by 71 ft., by 10 ft. 6 in. Some large supply-pipes have also been laid.

On Monday last the ceremony of laying a foundation-stone in connexion with the new water-works for Dalry was celebrated with considerable rejoicing. The cost of these works will be about £8000, and there is much grumbling in certain quarters that a much less expensive scheme was not adopted. It is alleged that an equally good supply could have been obtained for £3000 or £4000.

An extensive water supply scheme is at present engaging the attention of Mr. Gale, C.E., Glasgow, by whom it is proposed to launch a private company for the supply of Bothwell and other populous places in Mid-Lanarkshire. The Bothwell Local Authority have had various schemes under consideration during the past few years. It is understood that the Board of Supervision are favourable to a comprehensive scheme like that contemplated.

During the last few days pig iron has been much firmer in tone. Considerable quantities have been sent into the warrant stores, and prices have risen to 62s. It would seem as if there was a slight "rig" on. Several of the well-known brands of makers iron were advanced 1s. or 2s. per ton on Friday afternoon.

No improvement is observable in the coal trade in Lanarkshire, and prices remain unaltered. In Fifeshire there is a very fair amount of activity.

Reductions in the Price of Gas.—The Wakefield Gas Company have reduced the price of gas from 3s. 6d. to 3s. per 1000 feet from the 1st of July last. At Wisbech the price is reduced from 5s. 4d. to 4s. 10d.

Epworth Gas Company.—The annual meeting was held on Monday. Mr. Taylor, chairman of the board of directors, presided. It was resolved that a dividend of 7 per cent. be declared. The retiring directors were re-elected, as was the auditor. An application from the manager for an increase of salary was refused.

Stockton and Middlesbrough Water-Works Company.—The half-yearly meeting was held on Tuesday, the 3rd inst., Mr. H. Pease presiding. The balance-sheet showed an available balance of £15,015 15s. 4d. Dividends were declared on the original and A shares at the rate of 12s. 6d. per share; on the B and D shares paid up at the rate of 10s. per share; also payment of the arrears of dividends on the original and A shares. Referring to the bill promoted by the company this session, the report stated that the lavish expenditure of money by the opponents of the bill occasioned a heavy outlay on the part of the company. The loss of the bill occasioned the directors no uneasiness, as they had the same confidence in the company which they ever had. The report and statement of accounts were adopted.

Pollution of the Thames.—In answer to a complaint made by Captain Burstal, on behalf of the Conservators of the Thames, in reference to an increased accumulation of mud in the river bed near the outfalls of the main drainage at Halfway Reach, Sir J. W. Bazalgette, the engineer to the Metropolitan Board, states that the board commenced taking soundings systematically every year since 1867, and these show that instead of an increase between 1867 and 1870, there was a reduction of deposit to the extent of 554,000 cubic yards over the area referred to in that period, so that the whole of the deposit shown by the conservators to have collected between 1861 and 1870 must have done so prior to 1867. Now it may be thought possible that the whole of the accumulation between 1861 and 1867 was deposited in the year 1866, after the opening of the board's outlets, but this supposition is quite inconsistent with the large decrease of deposit in the succeeding years; and some soundings taken by the board in 1864 show that a very large accumulation of deposit did take place between 1861 and 1864, and this could not have been the result of discharge of sewage from the board's outlets, for they were not then opened. Thus it has been shown not only that the deposit prior to 1867 did not arise from the discharge of sewage at the board's outlet, but that deposits, and to a large extent, did occur prior to the discharge of sewage, and consequently from some other sources.

Diminution of Rivers.—The Imperial Academy of Sciences at Vienna has taken up a question in which all Europe may be said to be interested—namely, the decrease of the quantity of water in springs, streams, and rivers. A circular, accompanied by an able and instructive report, has been addressed to scientific societies in other countries, in the hope that they may be persuaded to undertake observations which, in course of time, may furnish *data* for practical use. The Academy calls attention to the fact that for some years past a diminution of the waters of the Danube and other great rivers has been noticed, and especially since the modern practice of cutting down forests without regard to consequences has prevailed. The Austrian Engineers and Architects Union have also taken the question in hand, and appointed a "hydrotechnic committee" to collect facts and prepare a report. The Danube, the Elbe, and the Rhine were each assigned to two members, while other two were to examine into the meteorology of the subject, and into the influence which glaciers and Alpine torrents may have on the general result. The committee regard the question as urgent; they recommend the immediate adoption of remedial measures, and they are unanimous in declaring that the prime cause of the injurious decrease of water is the devastation of forests. If cannot be too strongly impressed upon all in the United Kingdom that the system of injudicious drainage of agricultural districts has seriously interfered with the natural condition of all our rivers.—*Athenæum.*

Truro Gas-Works—Change of Management.—Another change has taken place in the management of the Truro Gas-Works. Mr. H. O. Eldridge, who has been manager of the works for a period of three years, has secured a good appointment as manager of the Bath Gas-Works, and has left the town, and Mr. Greenaway, from Maidstone, takes his place. How far the change will contribute to the greater efficiency of the works, to the greater purity and the cheapening of the gas at Truro remains to be seen; but we cannot allow Mr. Eldridge to depart without a kind word, and the expression of a hearty wish for his future welfare. During the time he was at Truro the gas-works underwent very great improvements. He spent on behalf of the company over £3000 in alterations and improvements, including a large new gasometer, and the whole of the work was carried out under his inspection to the entire satisfaction of the company. He is thoroughly up to his business, and will, we doubt not, succeed in earning for himself the confidence of his employers in his new and larger sphere of operations. It is gratifying to note that while Mr. Eldridge succeeded in gaining the esteem of his employers he also earned and obtained the respect of the *employés* under him, who on the occasion of his leaving made him an appropriate present, accompanied with a very nice letter, expressing the heartiest wishes for his future welfare. Mr. Eldridge has taken with him a Cornish wife, which must occasionally remind him of the county, and perhaps induce him hereafter to give it an occasional visit.—*West Britain.*

Lighting Railway Carriages by Gas.—It is stated that the Central Swiss Company has recently made some experiments in lighting railway carriages by gas, the results of which are highly satisfactory. The gas is enclosed in a special receptacle for each carriage. The gas which burns best is that obtained from the refuse of oil, the volume for an equal light being only one-fourth that of coal gas. The inventor is Herr Hirzel, of Zurich, a Leipzic professor. The process consists in forcing, by the aid of a self-acting apparatus, the refuse of fat substances, or of petroleum, &c., into retorts, which are heated in furnaces in the same manner as retorts for coal gas. Over the furnace is a hydraulic main for preventing the gas evolved from returning to the retorts. The gas next passes into a purifier, and lastly into a gasometer, the dimensions of which are much smaller in proportion than in those for coal gas. The counters, regulation of pressure, &c., are the same as in ordinary gas-works. A flame of an intensity equal to eight flames from carcel oil costs about 1¼d. an hour, including the cost of works, interest on capital, and labour. With 220 lbs. of refuse, from 2400 to 2600 cubic feet of gas are produced; and a flame equal to 10 carcel flames consumes about 1 cubic foot an hour. The gas thus obtained is compressed by means of a pump to 10 or 12 atmospheres in reservoirs fixed under the carriages, whence it is led by pipes to the burners, after having passed through a pressure regulator.

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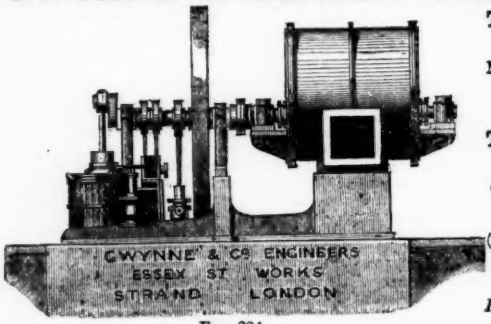

Fig. 224.

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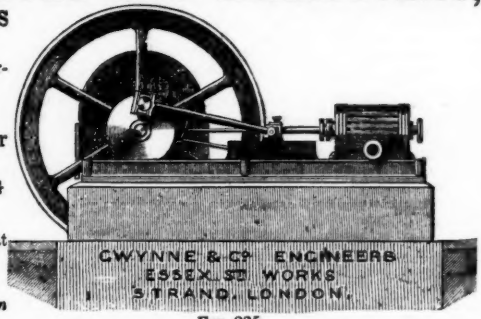

Fig. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. Gwynne and Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

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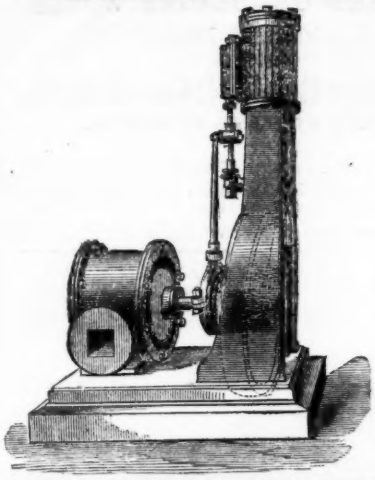

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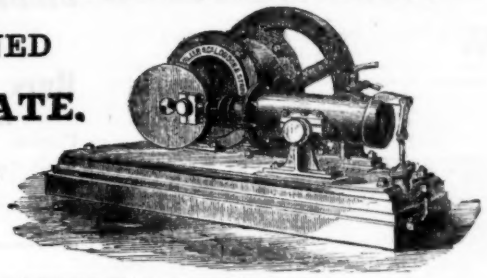
Who, since Mr. BEALE'S retirement, are the Oldest Makers.



EXHAUSTERS with HORIZONTAL ENGINE combined.
EXHAUSTERS with OUTSIDE BEARINGS.
MAKERS of ENGINES, BOILERS, and GAS MACHINERY.
TAR, LIQUOR, and SYPHON PUMPS. GAS-VALVES in stock, 2 to 30 inches.
SELF-ACTING BYE-PASS VALVES, with Lid and Relieving Lever.
MANN'S and many other descriptions of WATER DISTRIBUTORS.
SCRUBBERS, PURIFIERS, and CONDENSERS.
EXHAUSTERS from 3000 to 60,000, new and second hand, in stock.

PHŒNIX ENGINEERING WORKS, HOLLAND STREET, S.E., & at STROUD, GLOUCESTERSHIRE.

D. BRUCE PEEBLES & CO.,

ENGINEERS,

FOUNTAINBRIDGE WORKS, EDINBURGH,

MANUFACTURERS OF WET AND DRY GAS-METERS;

Patentees and Sole Manufacturers of PEEBLES' LAMP-GOVERNORS,

ABOVE 30,000 OF WHICH ARE NOW IN USE.

"These Lamp-Governors are so superior that they are likely to supplant all others."—*Dr. Wm. Wallace, F.R.S., F.C.S.*

D. BRUCE PEEBLES AND CO., FOUNTAINBRIDGE WORKS, EDINBURGH.

Now ready, Second Edition, price 7s., by post 7s. 3d.,

THE

GAS MANAGER'S HANDBOOK.

By THOMAS NEWBIGGING, A.I.C.E.

Orders to be sent to the Publisher,

WILLIAM B. KING,

11, BOLT COURT, FLEET STREET, LONDON, E.C.

MESSRS. JOHN BETHELL & CO.,

(ESTABLISHED 1836,)

CONTRACTORS for GAS TAR,

MAKERS OF ANTHRACENE, CREOSOTE, &c.,

CLAYTON CHEMICAL WORKS, MANCHESTER;
SWAN VILLAGE, WEST BROMWICH.

Head Offices: 38, KING WILLIAM STREET, LONDON BRIDGE.

LIME SUPERSEDED

IN THE

PURIFICATION OF ILLUMINATING GAS

BY

SPENCE'S PATENT DRY COPPERAS.

The only purifying material which removes by one process, without injury to the purifiers, all Ammonia and Sulphuretted Hydrogen. It has been in use for upwards of five years at some of the largest Gas-Works in the Kingdom.

TESTIMONIALS SENT ON APPLICATION TO

SPENCE BROTHERS CHEMICAL COMPANY, LIMITED,

VICTORIA CHEMICAL WORKS, BRADFORD, MANCHESTER;

SOLE MANUFACTURERS OF SPENCE'S PATENT DRY COPPERAS, SPENCE'S PATENT GAS DEODORIZER, AND MUDIE'S DISINFECTANT;

MANUFACTURERS OF

SULPHATE OF AMMONIA, VITRIOL, COPPERAS, &c.;

PURCHASERS OF SPENT OXIDE AND AMMONIACAL LIQUOR, AND CONTRACTORS FOR THE PURIFICATION OF COAL GAS.

WANTED, at once, a Leading Stoker, accustomed to scoop work.
Send age, references, and state wages required, to No. 188, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Youth as Assistant GAS-FITTER.
Apply, by letter, to SECRETARY, Gas and Water Works, MONMOUTH.

WANTED, the Management of Gas-Works. Understands main-laying and all out-door work. No objection to go abroad.
Address No. 187, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS ENGINEERS, &c.

WANTED, by the Steyning Gas Company, Limited, an Iron GASHOLDER, to contain 1500 cubic feet, with balances, &c., complete.
Apply, by letter, to Mr. J. P. DURRANT, Manager, STEYNING.

WANTED, an experienced Man at a country Gas-Work. Wages 30s. per week, with house, coal, and gas. Night man employed during winter months.
Apply, with references, to Messrs. WILLEY AND FORD, Gas Engineers, EXETER.

WANTED, by the Advertiser, a situation as MANAGER of a Gas-Work. Competent to lay mains and services, fix meters, and do general repairs, having had 20 years experience in erecting and managing Gas-Works. (No objection to stoking.) Good testimonials.
Address No. 190, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the son of a Gas Engineer, the MANAGEMENT of a Gas-Work, where a stoker is kept in the summer time, or Assistant Manager of a larger work, and to take the out-door superintendence, the reading of meter indices, and collection of accounts, &c.
Address No. 179, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Advertiser, a situation as MANAGER of small Gas-Works. Qualifications: stoking, main and service laying, meter taking, fitting, &c. Twelve years experience at home and abroad. Good testimonials. South Wales preferred.
Address No. 189, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS STOKERS.

WANTED, a Stoker for night duty, at a Gas-Work 10 miles from London, making about 9 millions per year. Constant employment for a steady man. Wages 24s. 6d. per week, with beer allowance. Assistance provided eight months per year.
Address No. 186, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a thoroughly practical Man, a situation as MANAGER and Collector, of moderate sized, or Assistant Manager of large, Gas-Works; 14 years experience. Present appointment Manager of Works making about 10 millions per annum. First-class references and satisfactory reasons for leaving present employ.
Address E. L. S., care of F. Russell, Gas-Works, ILFRACOMBE.

WANTED, a Stoker. Constant employment. Wages 28s. per week. Accustomed to manage an exhauster.

Apply, with testimonials, to S. Sowood, Manager, Gas-Works, Belper.

WANTED, by the Aberdare Gas Company, an efficient House GAS-FITTER. One whose time has been spent in the employ of Gas Companies, with some knowledge of meter testing and repairing preferred. Constant employment to a suitable man.

Applications, with references and length of service in last situation, to be addressed to Mr. E. Jones, Manager and Secretary of the Company.

WANTED, a situation as Manager of Gas-Works, where the make is over 12 millions per annum, or Assistant Manager of a larger works. Advertiser is practically acquainted with the manufacture and distribution of gas, retort setting and working. Is also a good draughtsman. Good testimonials and references.

Address J. H., Mr. William Cox, 36 and 37, High Street, Deritend, Birmingham.

GAS MANAGER WANTED.

WANTED, by the Arbroath Gas Corporation, a properly qualified person to act as MANAGER of their works, to enter on his duties on Monday, the 30th of August next, or as soon thereafter as may be arranged. Salary £130 per annum, with a free house, coals, gas, and taxes.

Further particulars may be obtained on application to David Chapel, Solicitor, Arbroath, Clerk to the Corporation, with whom applications and testimonials are to be lodged on or before the 16th of August next.

Arbroath, July 28, 1875.

A Practical Gas-Fitter, of six years experience, is open to a RE-ENGAGEMENT. Well up in all branches of the trade. Married; aged 29. Served apprenticeship in London.

Address C. J. M., care of Mr. Barrett, No. 3, Gashouse Lane, Newbury, Berks.

New Edition, Now Ready,

ADVANTAGES OF GAS FOR

COOKING AND HEATING.

By MAGNUS OHREN, A.I.C.E., F.C.S.

For Companies to issue to their Gas Consumers.

Specimen Copy by post Threepence, direct from Magnus Ohren, Gas-Works Lower Sydenham, London, S.E.

PURIFIERS.

THE Corporation of Carnarvon require a set of Four 8 ft. PURIFIERS (second-hand).

Prices and particulars to be sent to the undersigned.

R. D. Jones, Borough Surveyor.

Corporation Offices, Carnarvon, Aug. 8, 1875.

FOR SALE, very cheap, a dry Gas-METER, 100 lights, in good condition.

Apply to Leach and Scamell, Salisbury.

FOR SALE—A 4-horse Engine and Ex-HAUSTER, to pass 10,000 cubic feet per hour. Self-acting bye-pass and two gas-valves, 8-in. connexions and exhauster governor.

For further particulars, or to view the same now working, apply at the Gas-Works, Walton-on-Thames.

THE St. Day Fire-Brick and China Clay Company, Limited, having largely increased their works, are now prepared to TENDER in any quantity for the supply of their well-known BRICKS and other FIRE GOODS, either for the Home trade or exportation. Prices and samples will be forwarded on application to the works, St. Day, Cornwall, or the London Offices, 7, St. Bene't Place, Gracechurch Street.

TO IRONFOUNDERS.

THE Chorley Commissioners are pre-pared to receive TENDERS for the construction and erection of a Wrought-Iron ROOF, 61 ft. span and 103 ft. 6 in. long, for a retort-house at the Gas-Works, Chorley.

The plans and specification may be seen, and further particulars obtained, on application to Mr. Thomas Hamer, Manager, Gas-Works, Water Street, Chorley.

Sealed tenders to be sent to the undersigned on or before the 17th of August, 1875.—By order,

Richard Jackson,
Clerk to the Chorley Commissioners.

Chorley, Aug. 5, 1875.

THE Richmond (Surrey) Gas Company wish to receive TENDERS for 100 tons of CANNEL COAL, to be delivered at the rate of 25 tons per month, during the last four months of this year, in trucks on the Company's siding adjoining the works, free of all expense, to be weighed by the Company's machine, and paid for accordingly.

Sealed tenders, to be addressed to the Chairman, Gas-Works, Richmond, Surrey, must be received not later than Ten a.m., on the 14th of August, 1875.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
E. B. Blott, Secretary.

Richmond, Aug. 4, 1875.

RIPON CITY GAS-WORKS.

MANAGER WANTED.

THE Local Board for this City wish to engage a thoroughly competent and experienced MANAGER for their Gas-Works, at a salary beginning at £100 per annum, with a good house and garden rent free, and coals, gas, and water; and the parochial and local board's rates will be provided, or paid for, for him.

Applications, in the candidate's own writing, marked on the outside, "Gas-Works Manager," and stating age and previous employment, with testimonials as to character and fitness for the appointment, are to be sent in on or before Saturday, the 14th day of August next, to me at my Offices in Ripon, where also any further information required may be obtained.

R. W. Nicholson,
Town-Clerk and Clerk to the Local Board.

Ripon, July 28, 1875.

B. GIBBONS, Jun.,

DIBDALE FIRE-CLAY, BRICK, AND GAS-RETORT WORKS,

STOURBRIDGE (Established 1834),

MANUFACTURER OF EVERY DESCRIPTION OF

Burs, Lumps, Stays, Shields & other Bricks, & Gas-Retorts,

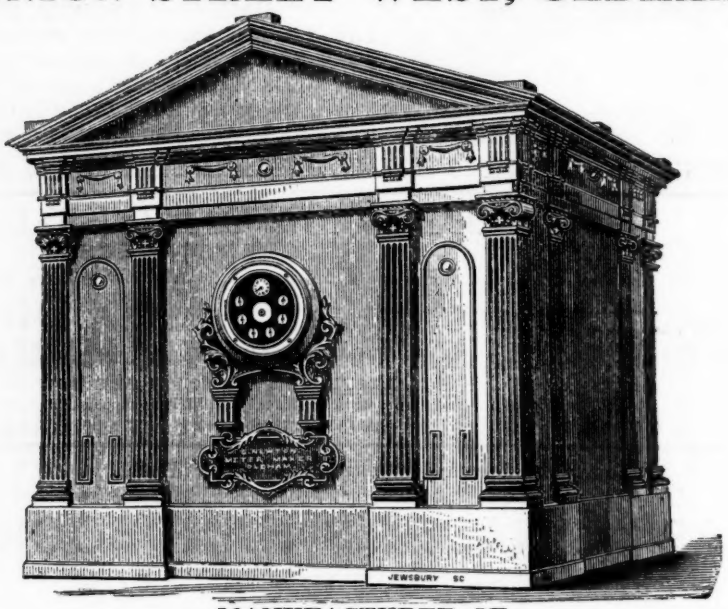
A LARGE QUANTITY OF RETORTS ALWAYS IN STOCK.

Circular .	14 in.,	15 in.,	16 in.,	18 in.
Ovals . .	17 in. × 14 in.,	17 in. × 15 in.,	20 in. × 15 in.,	21 in. × 15 in., &c.
D's. . .	14 in. × 14 in.,	15 in. × 12 in.,	15 in. × 13 in.,	17 in. × 14 in., 18 in. × 13 in.
	18 in. × 15 in.,	20 in. × 16 in.,	22 in. × 14 in.,	24 in. × 14 in., 24 in. × 15 in., &c.

Special attention given to the execution of Export Orders.

GEORGE NEWTON,

UNION STREET WEST, OLDHAM,



MANUFACTURER OF

SQUARE STATION-METERS, with PLANED JOINTS;

ROUND STATION-METERS, with CAST-IRON STANDS;

WET AND DRY CONSUMERS GAS-METERS, GOVERNORS, &c.

SAM. CUTLER & SONS,

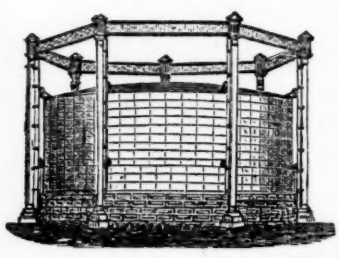
CONTRACTING GAS ENGINEERS,

GASHOLDER & GENERAL GAS APPARATUS MAKERS,

MANUFACTURERS OF

BOILERS, IRON ROOFING, IRON BRIDGES,

AND GENERAL IRONWORK.



S. C. and Sons undertake Contracts of any magnitude for the **Erection of new and Remodelling of existing Gas-Works,** for **Gasholders, Cast and Wrought Iron Tanks, Iron Roofs,** and every description of **Apparatus** for the Manufacture and Distribution of Gas.

Special attention is invited to their **"Improved Condenser,"** which is very effective, and much approved; also to their patterns of **Annular** and other **Condensers, Scrubbers,** and **Purifiers,** of all sizes, which they arrange either with **Centre** or Ordinary **Slide Valves.**

WORKS FOR THE SUPPLY OF

VILLAGES, MANSIONS. FACTORIES, &c.

S. C. and Sons undertake the **Supply** and **Laying** of **Mains** for **Gas and Water,** and supply all Castings, Connexions, and Fittings for Retort-House, Works generally, and for Streets. They also supply **Valves** of all descriptions, Iron and Clay Retorts, Hotpressed Retort-Lids, Steel Charging-Scoops of improved make, for which they have special machinery, Improved Coke and Coal Barrows, Cross-Bars and Screws, Bolts and Nuts, Furnace and Stoking Tools, Iron and Wood Purifier-Sieves, Lead, Yarn, Borings, &c., including every requisite whatsoever for a Gas-Work, a well-assorted stock being kept of those goods most in request.

SOLE MAKERS OF BRETT'S PATENT COKE BARROW.

Experienced Retort Setters sent to any part of the Kingdom.

Address: PROVIDENCE IRON-WORKS, MILLWALL, LONDON.

JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

ALFRED WILLIAMS,

PHŒNIX FIRE-BRICK WHARF,

64, BANKSIDE, SOUTHWARK, LONDON, S.E.

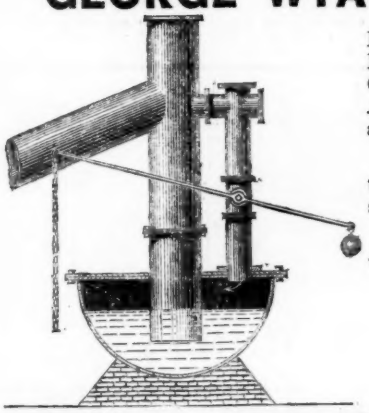
GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS,

AND FOR THE

SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,

AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.

GEORGE WYATT'S INVENTION



For Removing the Pressure caused by the Hydraulic Seal prevents the Accumulation of Carbon in the Retorts, and Stoppages in the Ascension-Pipes; and Increases the Quantity and Quality of Gas Manufactured.

This Invention has been in constant operation for the last twelve months, with marked success.

Testimonials and particulars will be forwarded on application to the Inventor,

GEORGE WYATT,

ILMINSTER GAS-WORKS,

SOMERSET.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is hereby given that the ORDINARY HALF-YEARLY GENERAL MEETING of the PROPRIETORS of the above Company will be held at the London Tavern, Bishopsgate Street, in the City of London, on TUESDAY, the 24th day of August inst., at Two o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts for the half year ending the 30th day of June last, to declare a Dividend, and to transact the general business of the Company.

The Transfer Books will be closed from the 10th to the 24th inst., both inclusive.

By order of the Board.

ALFRED LASS, Secretary.

Offices, 60, Cornhill, London, Aug. 6, 1875.

THE Scarborough Gas Company have

FOR SALE, in consequence of removing to their New Works, a first-class Telescope GASHOLDER, 52 ft. in diameter and 44 ft. deep. It was made and erected by C. and W. Walker, of Donnington, in 1868, and is in excellent condition. It is of remarkably good workmanship, being perfectly circular and true, and free from all irregularities. The columns and girders are of handsome design and highest class of work.

Gas Companies wanting a good Gasholder this year will find this an advantageous opportunity.

For further particulars apply to

JAMES MOON, Gas Engineer, Scarborough.

SULPHATE OF AMMONIA.

WHY sell your Liquor when it pays you

better to work it up yourselves?

Consult J. JUDGE, Chemical Burner, &c., who has put up several sets for Gas Companies with success. J. J. will undertake the management of this department for any large Company at home or abroad. Distilling of tar. Large Companies could make sulphuric acid to advantage. Success sure and nuisance got rid of.

2, Sussex Terrace, New Road, WANDSWORTH ROAD, S.W.

COST PRICE SHEETS.

MANUFACTURE AND DISTRIBUTION OF GAS.

These sheets are the same as were laid before the Dublin Meeting of the British Association of Gas Managers; but in the REPRINT, NOTES have been added for the guidance of those using them. Copies of the two sheets may now be had, price 5s.

South Shields. W. J. WARNER.

IN THE MATTER OF BRONNER'S PATENT BURNERS.

NOTICE is Hereby Given that Julius

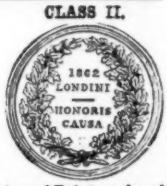
Brönner, on the 20th of April, 1875, in a suit in Chancery, 1874, B 365, obtained an injunction perpetually restraining the Defendant, his Agents, Servants, and Workmen, from in any way advertising or offering for sale, or selling, or from in any manner causing to be advertised, or offered for sale, or sold as "Real Brönner," or "Brönner," or "Broehner" Burners, any Burner not manufactured by or for the Plaintiff, Julius Brönner, or by his Agents.

JACKSON, FOX, AND ELLEN,
55, Chancery Lane, London,
Solicitors for the Plaintiff,
JULIUS BRÖNNER, Frankfort-on-Maine.

1862.

PATENT ANTIMONY PAINT.

CLASS II.



MADE ONLY BY

GEORGE HALLETT & CO.,

296, ROTHERHITHE, LONDON, S.E.

This Paint having been in general use over thirteen years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced or resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (30s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

The following Gas Companies in London have used the Paint for years—viz., The Gaslight and Coke, Imperial, Independent, City of London, Commercial, London, and Surrey Consumers.

N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs about 20s. per cwt., as compared with White Lead at 30s. per cwt.; a similar economy arises from its use in Steam and Gas Joints, for which purpose it is superior to White Lead.

SPECIAL DRIERS FOR ANTIMONY PAINT SUPPLIED.

HODGE & CO.'S

IMPROVED VENTILATING SUN-LIGHTS

WITH TALC REFLECTORS AND SELF-ACTING VALVES

TO PREVENT DOWN-DRAUGHT;

VENTILATING GLOBE LIGHTS for DINING-ROOMS, LIBRARIES, &c.

Ormolu, Bronze, & Crystal Gaseliers;

MEDIÆVAL CHURCH WORK AND CORONÆ

COCKS, VALVES, and FITTINGS for GAS, STEAM, and WATER;

COLUMNS, BRACKETS, & STREET LANTERNS;

BLACK AND GALVANIZED BARREL COMPO AND TIN PIPE.

GAS ENGINEERS,

100, HATTON GARDEN, LONDON.

Drawings and Prices upon application.

T. NEWBIGGING,
CONSULTING GAS ENGINEER,
ECCLES, MANCHESTER.

D. A. GRAHAM,
CONSULTING GAS ENGINEER,
STALYBRIDGE, NEAR MANCHESTER,
Erects Horizontal Condensers, Retort Settings, Pumps, Self-Acting Exhauster Governors, Coal-Testing Apparatus, &c., &c.
Gas-Works surveyed, mapped, and reported on, and extensions or alterations designed and the particulars specified, and work estimated for and executed.

D. M. NELSON,
48, GORDON STREET (late 135, BUCHANAN ST.), **GLASGOW,**
Supplies every requisite in connexion with the distribution of Gas and Water.
Estimates and prices on application.
WOOD GRIDS for Purifiers and Scrubbers.
Cast-Iron PIPES and VALVES.
Street LAMP-PILLARS.
Patent Pipe SCREWING-MACHINES, &c.

Mr. ALFRED LASS,
60, CORNHILL, LONDON, E.C.,
Is prepared to open the Books, and, if necessary, keep the Accounts of Gas and Water Companies.
To examine the Books and Accounts, and prepare Balance-Sheets for the information of Directors.
To assist Secretaries in preparing Balance-Sheets, according to the "Gas-Works Clauses Act, 1871;" or may be consulted with respect to Accounts generally.

TO INVENTORS AND PATENTEES.
MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.
Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.
Patents procured for Foreign Countries.
Information as to cost, &c, supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

THOMAS ALLAN & SONS, of Springbank Iron-Works, Glasgow, manufacture small cast-iron GAS AND WATER PIPES, 1½ to 6 inches, at their branch works, Stockton-on-Tees, and have at present a large stock, which they are open to sell at moderate prices.

WOLSTON'S TORBAY IRON PAINTS.
THE Torbay and Dart Paint Company, Limited, 23, Great George Street, Westminster, S.W., having been informed that PAINTS not manufactured by them are being offered to Gas Companies and the public as "WOLSTON'S," hereby give notice that they will TAKE PROCEEDINGS against any persons infringing their rights as sole proprietors and manufacturers of Wolston's Torbay Iron Paints.
(See Advertisement on another page.

BAILEY'S Patented Inventions are now in extensive use wherever steam is known. Bailey's Patent Steam Gauges, Pyrometers, Water Gauge Cocks, Test Pumps, Fusible Plugs, Steam and Water Valves, Safety Valves, Junction Valves, Pumps, Tell-Tales, Recorders, Lightning Conductors, Electric Telegraphs, Turret Clocks, Steam Joint Cement, Lifting Jacks, Boiler Feeders, Lime Catcher and Separator, Injectors and Ejectors, and every description of first-class Brass Work for Engines and Boilers. Gas-Works Managers who have not our large book should send for it.

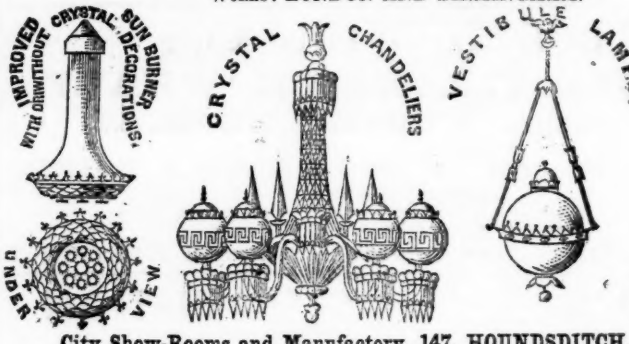
16th edition, 1000 engravings, 4to., post free 2s. in stamps, weight 10 oz., cost of production £1000,
BAILEY'S Illustrated Inventions, containing details and prices of goods in our five several departments:—(1) Brass Foundry, Steam Gauges, Indicators, Feeders, and Fittings; (2) Engineers Sundries, Small Tools, and Stores; (3) Machine Pump and Fire Engine: (4) Turret Clock, &c.; (5) Electric Telegraph, A B C Instruments, Bells, and Apparatus.
J. BAILEY and Co., Albion Works, Salford, LANCASHIRE.

CAFFALL, THOMAS, & CO.,
LIMITED,
Are prepared to supply and erect their
PATENT MOVEABLE SEALS
FOR DIP-PIPES,
Or to grant Licences for the Manufacture and Use of the same.
Particulars may be obtained on application at the Offices,
75, FLEET STREET, LONDON, E.C.

C. & W. WALKER'S
WOOD PURIFIER SIEVES,
Which have now been used for twelve years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,
DONNINGTON, NEAR NEWPORT, SHROPSHIRE.
8, FINSBURY CIRCUS, LONDON.

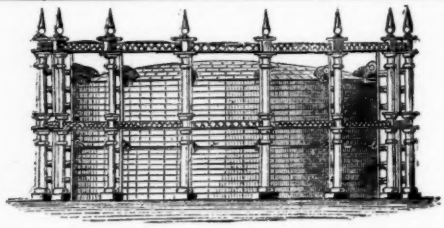
TO GAS COMPANIES AND THE TRADE.
J. DEFRIES & SONS,
MANUFACTURERS OF
CRYSTAL, BRONZED, & ORMOLU CHANDELIERS, IMPROVED CRYSTAL STAR & SUN LIGHTS, VESTIBULE LAMPS, AND THE PATENT CRYSTAL ILLUMINATION.
A LARGE STOCK ALWAYS IN HAND OF
IRON, BRASS, COMPOSITE, AND LEAD TUBES, FOR GAS AND WATER,
AND EVERY DESCRIPTION OF
GAS AND WATER FITTINGS.
THE PATENT DRY AND WET METER, WITH THE LATEST IMPROVEMENTS.
STREET LAMPS AND COLUMNS IN GREAT VARIETY.
WORKS: LONDON AND BIRMINGHAM.



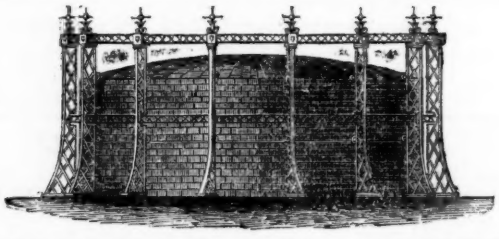
GAS MOONS, Cut and Engraved, of the newest designs
GAS REFLECTORS In Silver and Glass
GAS NIBS AND **BURNERS** Of every description.

Pattern-Books of Gas-Fittings, Crystal and Ormolu Chandeliers for 1873, are now complete.

City Show-Rooms and Manufactory, 147, HOUNDSDITCH, LONDON.
ESTABLISHED 1830.

HOPE IRON WORKS,

STOCKTON ON TEES.

ASHMORE & WHILE,
GAS ENGINEERS & CONTRACTORS,
MANUFACTURERS OF GASHOLDERS,
GAS APPARATUS OF EVERY DESCRIPTION,
Including Improved
Retort-Lids, Boilers, Cast and Wrought Iron Tanks, Iron Roofing, Bridges, Girders,
And GENERAL IRONWORK.
N.B—Estimates for all Gas Plant and Remodelling supplied on application.



THE HORSELEY COMPANY,
LIMITED,
TIPTON, STAFFORDSHIRE.
LONDON OFFICE:
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GAS ENGINEERS, IRONFOUNDERS, &c.,
MANUFACTURERS OF
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AND ALL REQUISITES FOR EITHER
GAS OR WATER WORKS;
ALSO
MAKERS OF ROOFS, BRIDGES, &c.

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ESTABLISHED 1807.

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WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

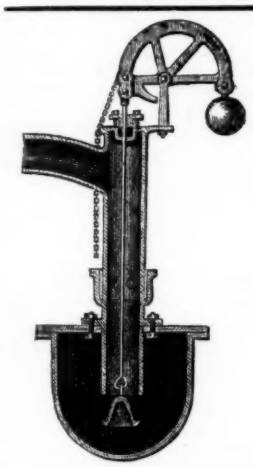
2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.



BOX'S
PATENT ANTI-DIP VALVE

Affords a clear gas way through the dip-pipe while the retort is in action, and produces a perfect seal at pleasure, or whenever the retort is open, offering great security against the drawing of air, and obviating the necessity for using any liquid in the now so-called hydraulic main. It is easy of application to existing apparatus, and is comparatively inexpensive. Is not likely to get out of order, as the tar, which will adhere to the botton of the dip-pipe and the flange of the cone, both of which are faced, will act as a lubricant, and prevent undue wear and tear. The whole, as will be seen on inspecting the accompanying illustration, is exceedingly simple, and every part accessible. To adapt it to the present dips, all that is necessary is to face the bottom edge of the dip-pipe, and suspend a cone by a rod, which passes through the bonnet, the raising and lowering of the cone being performed through the intervention of a weighted eccentric.

The Patentee is prepared to supply Patented Apparatus upon the most moderate terms, and will be happy to reply to any inquiries that may by adddressed as under—

W. BOX,

GAS-WORKS, CRAYFORD, KENT

KÖRTING BROTHERS,

SOLE LICENSEES FOR

W. CLELAND'S PATENT STEAM-JET GAS-EXHAUSTER.

E. KÖRTING'S PATENT STEAM-JET GAS-EXHAUSTER.

Small Cost—Compactness—Perfectly Self-Acting—Self-Regulating—Self-Cleansing—Smallest Boiler Pressure Sufficient—No Steam-Engine—No Gearing—No Attention—No Extra Room Required—No Tear and Wear—No Noise—No Oscillation in Vacuum, or Back Pressure.

UPWARDS of 150 in USE in CONTINENTAL GAS-WORKS.

IN ENGLAND SUPPLIED TO—

Chartered Gas Co., London.
London Gaslight Co., London.
South Metropolitan Gas Co., London.
Phœnix Gaslight and Coke Co., London.
Liverpool United Gaslight Co., Linacre.
Corporation Gas-Works, Bolton.
Cornholme District Gas-Works, near Todmorden.

These Gas-Exhausters are kept in stock in 16 different sizes, delivering from 500 cubic feet to 60,000 cubic feet of Gas per Hour.

E. KÖRTING'S PATENT STEAM-JET REVIVIFYING BLOWERS

For the Purifying Material are kept in Stock in three different Sizes. Upwards of 100 in use.

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Phœnix Gas Co., South Metropolitan Gas Co., Chartered Gas Co., London Gaslight Co., Independent Gas Co., in London.
Gas-Works, Brentford, Middlesex.

We beg to inform Gas Engineers that we are Licensees for

W. CLELAND'S PATENT STEAM GAS-SCRUBBER,

Combining small cost and thorough efficiency with absence of any mechanical means and necessity of renewing the scrubbing material.

For particulars apply to **KÖRTING BROTHERS,**

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GEBR. KÖRTING, HANNOVER, GERMANY.

SCHUTTE AND GOEHRING, 222, WALNUT STREET, PHILADELPHIA, U.S.

KÖRTING BROTHERS,

STEAM-JET GAS-EXHAUSTERS AND REVIVIFYING BLOWERS FOR OXIDE.

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THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS, &c., &c.,

SCOTSWOOD FIRE-BRICK WORKS,

SCOTSWOOD-ON-TYNE.

THOMAS LAMBERT & SONS

MANUFACTURE EVERY DESCRIPTION OF

GAS AND WATER FITTINGS;

ALSO,

WROUGHT-IRON TUBES & FITTINGS.

SHORT STREET, LAMBETH, LONDON.

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FIRE CLAY and BRICK WORKS,

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Proprietors of

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Manufacturers for Home and Export.

GAS-RETORTS, GLASS-HOUSE FURNACE, BLAST-FURNACE, & TANK BRICKS, LUMPS, TILES,

And Every Description of Best Fire-Bricks.

"SELLARS' CEMENT"

PREVENTS WASTE OF GAS FROM RETORTS;

SAVES CLAY RETORTS FROM DESTRUCTION BY FIRE;

GREATLY ECONOMIZES THE USE OF FIRE-BRICKS;

And PREVENTS ALL POSSIBLE LOSS of GAS FROM LEAKAGE.

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THE ORIGINAL MANUFACTURER OF

WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

WORKS:

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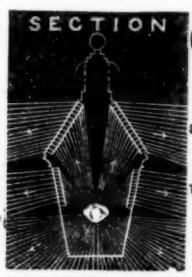


THE PATENT

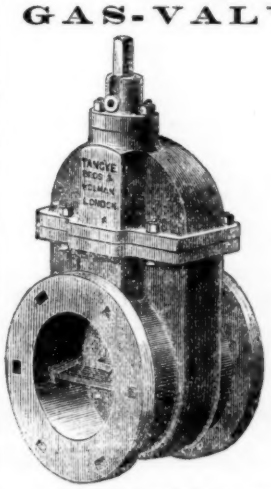
CATOPTRIC LAMP

Is now in use in Moorgate Street, Cheapside, and Trafalgar Square, and has been in successful operation upon Waterloo Bridge since Oct. 7, 1871.

T. A. SKELTON, 37, Essex St., Strand, LONDON, INVENTOR AND PATENTEE.

IMPROVED

GAS-VALVES,



AT GREATLY

REDUCED

PRICES.

Inch.	s.	d
2½	24	0
3	27	0
4	36	0
5	45	0
6	54	0
7	63	0
8	80	0
9	90	0
10	100	0
12	135	0
14	180	0

TANGYE BROS. & HOLMAN,

LAURENCE POUNTNEY LANE,

LONDON.

TORBAY AND DART PAINT COMPANY, LIMITED.

WORKS:
DARTMOUTH AND BRIXHAM, DEVON.

OFFICES:
23, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

SOLE PROPRIETORS AND MANUFACTURERS OF
WOLSTON'S CELEBRATED
TORBAY IRON PAINTS.
(ESTABLISHED 1851.)

TRADE MARK

These Paints have been for many years extensively used in Her Majesty's Royal Dockyards, Woolwich Arsenal, the Shorncliffe and Curragh Camps, War Departments, and Colonies, and are largely supplied to Railway, Harbour, and GAS COMPANIES, Shipowners, Engineering Establishments, Railway Carriage and Waggon Works, and the Paint Trade generally. They are the BEST PROTECTORS of IRONWORK, even arresting corrosion after it has set in; and their base being oxide of iron, they are free from those properties which make lead paints so destructive to ironwork. They do not scale or blister, are not affected by great heat, and are the only Paints which will resist the effects of sulphuretted hydrogen. Their DURABILITY and covering properties have borne the test of A QUARTER OF A CENTURY'S PRACTICAL TRIAL.

The undermentioned colours—ground in best linseed oil, and requiring only before use to be thinned down in the ordinary way—are kept in stock:—

Torbay Brown.	Torbay Red.
Dart Green.	Slate.
Dart Yellow.	Buff.
Brixham Black.	Torbay Chocolate.
Light Blue.	Cream Colour.
Dart Brown.	Dart Umber.
Imperial Stone.	Light Stone.
Bronze Green.	Salmon Colour.
Navy Green.	Lead.
Carriage Red.	Dark Stone.
Light Lead.	Crystal Palace Blue.
Light Green.	Iron Grey.

All other Colours made to order.

PRICES and TESTIMONIALS on APPLICATION.
(See Notice on another page.)

WATER-MAINS.
COTTERILL'S PATENT STEEL TUBE-DRILLS, for connecting services to water-mains, *under pressure*, without turning off the water. They drill and tap themselves, and are left in the mains. Made of all sizes, from ¾ to 2 inches and upwards. They cost less than the ordinary plan.
Apply to CHARLES FORSTER COTTERILL, Cannock, STAFFORD. Patentee.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE
FIRE CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS, TILES, and every description of FIRE-BRICK.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.
Successors to
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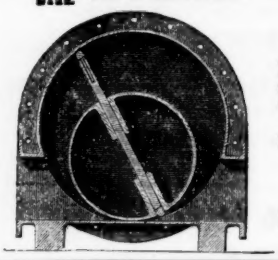
GAS AND WATER PIPES.
WILLIAM MACLEOD & CO.,
18 & 20, ALSTON STREET, GLASGOW.

CAST-IRON GAS AND WATER PIPES.

DELIVERY F.O.B. ON CLYDE.
Prices on application.

TRADE MARK
J. BEALE'S PATENT GAS EXHAUSTER.

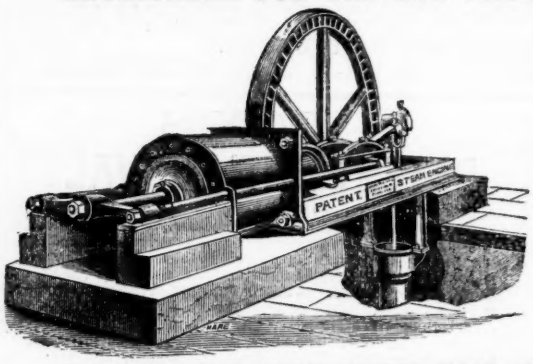


BEALE'S CONTINUOUSLY ACTING GAS EXHAUSTERS
ARE NOW MANUFACTURED BY
B. DONKIN & CO.

MR. J. BEALE, of East Greenwich, having retired from business, has made an arrangement with B. DONKIN & CO. for the sole manufacture of his Patent Solid-Slide Gas Exhausters.
B. D. & Co. also make Steam-Engines to drive Gas Exhausters direct or otherwise, and Gas-Valves.

Estimates and Prices on application to
B. DONKIN & CO.,
ENGINEERS & IRONFOUNDERS,
BERMONDSEY, LONDON, S.E.

ECONOMY OF FUEL IN STEAM-ENGINES.
B. DONKIN & CO.,
PATENT HORIZONTAL COMPOUND CONDENSING
STEAM-ENGINES,
APPLICABLE FOR DRIVING GAS-EXHAUSTERS.



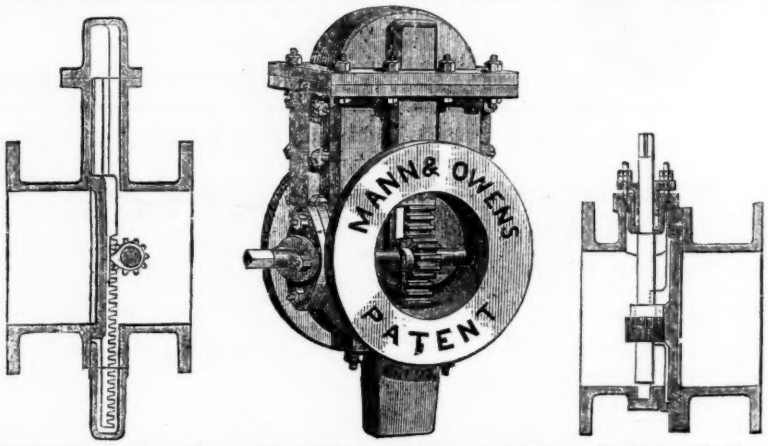
These Engines have been at work a sufficient number of years to prove their durability and efficiency.

One of them has been subjected to a scientific and exhaustive trial to test the consumption of fuel, with the result that an expenditure of less than 2 lbs. of coal per hour developed one indicated horse power.

Full Details of this Trial, and Prices, sent on application to

B. DONKIN & CO., BLUE ANCHOR ROAD, BERMONDSEY, S.E.

MANN & OWENS' PATENT GAS-VALVE.



SECTIONAL ELEVATION. VIEW SHOWING PINION AND RACK. SECTIONAL PLAN.

The advantages of this Patent Valve over all others yet introduced are, that it is always as tight as the best wedge or spring valve, without the possibility of setting fast or becoming suddenly leaky. The surfaces not being in contact during the operation of opening or closing, leakage through wear and tear is avoided.

The Gas Engineer will not fail to see the importance of such a valve in connexion with his purifying apparatus, particularly in the case of large sizes.

The slide being operated either by a screw and nut, or by a pinion and rack, a cam bearing upon a plane, cast on the back of the Valve, forces it against the face, and renders the escape of gas an impossibility. By a slight turn of the pinion or screw, the slide is released, and brought away from the face, by which means friction is avoided, and the only force required to open the Valve is that due to its own weight.

SOLE MANUFACTURERS:
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PRICES, SIZES, AND FULL PARTICULARS ON APPLICATION.

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GLOBE METER-WORKS, OLDHAM,

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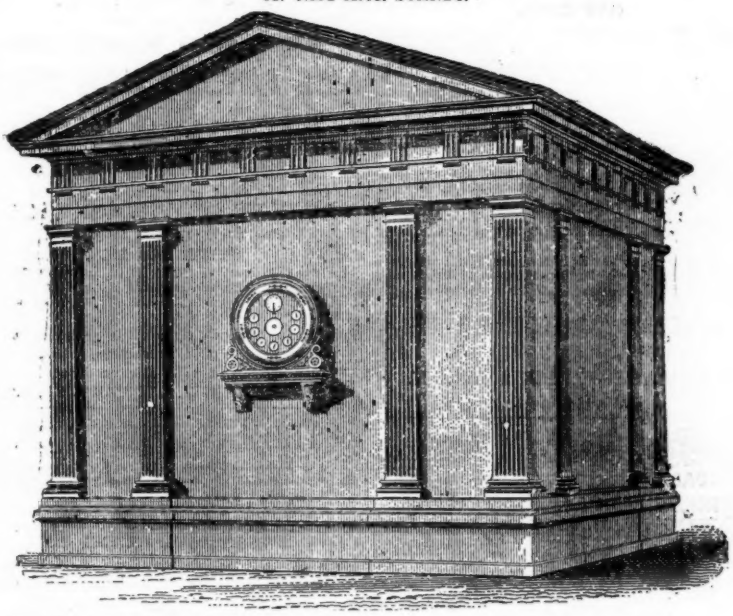
ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

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GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c., ON APPLICATION.

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MR. ANDERSON advises Companies on all matters connected with the manufacture of Gas and the construction of Works.

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RETORT SETTINGS, heated by tar without the production of smoke.
STEAM-ENGINES and EXHAUSTERS, separately or combined.
FOUR-WAY VALVES, one of which is equal to three ordinary Valves.
STATION GOVERNORS—the Gasholder cannot tilt and cause accident.

BREEZE AND TAR FUEL MACHINE.

A Pamphlet containing Eighteen Illustrations of the foregoing, with letterpress of the construction of Works, post free, 2s. 6d.

N.B.—The second edition of this Work, *now ready*, contains Illustrations of the Machine for converting Breeze and Tar into Fuel for heating the Retorts.

"The Author is well qualified to speak authoritatively upon the important subjects to which his pamphlet refers."—*Artisan*

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We are open to

BUY EITHER LARGE OR SMALL PARCELS.

State quantity and price, put free on rails, or delivered here to

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PLUTONIC CEMENT.

(REGISTERED.)

Indispensable to the Profitable Manufacture of Gas.

SOLE MANUFACTURER,

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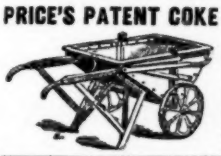
Gas Apparatus of all Descriptions supplied Complete and in Detail.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Keep in London and at their works large stocks of PIPES and CONNEXIONS (1½ to 36 inches in diameter); also make and supply Retorts, Tanks, Columns, Girders, Special Castings required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

CHARLES HORSLEY, Agent.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT

KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

FIRE-CLAY RETORTS.

WILLIAM FRASER,

INVERKEITHING,

Owner of the Works at which Fire-Clay Retorts were first made), can supply

RETORTS, FIRE-BRICKS, &c.,

to any extent.

References can be given to managers of above a hundred Gas-Works whom he supplies.

He ships at Charlestown his

CELEBRATED HALBEATH STEAM COALS,

on Navy List.

JAMES NEWTON & SONS.

(Established 1820,)

FIRE-BRICK AND TILE MERCHANTS,

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DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for

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MUIRKIRK, No. 1, CANNEL
Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

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Yields 10,700 cubic feet of 32·77-candle gas per ton, and 9½ cwts. of coke, containing 11 per cent. of ash.

OLD WEMYSS CANNEL
Yields 13,320 cubic feet of 32·5-candle gas per ton.
Prices and full Analyses on application.

GAS COAL
Of every description delivered f.o.b. United Kingdom, or cost freight and insurance Abroad, upon lowest terms.
Contracts undertaken for the Shipment, Insurance, and Delivery Abroad of Plant and Materials for Gas and Water Works, &c.
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THE EARL OF HUME'S
LESMAHAGOW
MAIN SEAM CANNEL COAL.
CRAIGNETHAN GAS COAL CO.,
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Analysis and Price on Application.

WYLAM WOOD COAL COMPANY,
LIMITED,
WYLAM-ON-TYNE.
WYLAM WOOD CANNEL COAL WORKED FROM ABOVE COLLIERY.
Analysis—10,280 cubic feet of gas per ton of Coal, having an Illuminating Power of 26·2 Sperm Candles, and yields 13¼ cwt of Coke per ton of Coal.
PORTS OF SHIPMENT:
TYNE DOCK AND NORTH DOCK, SUNDERLAND.
For prices and further particulars, apply to
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BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
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Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.
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INTERNATIONAL EXHIBITION, 1862.
CLASS X.
PRIZE MEDAL
For excellence of Fire-Clay Gas Retorts, and "HONOURABLE MENTION" for good quality of Fire-Bricks.
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SHIPPERS OF ALL DESCRIPTIONS OF
GAS AND STEAM COALS.
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THE
HUCKNALL COLLIERY COMPANY
Can offer a CANNEL COAL yielding a large quantity of Gas of superior quality.
Prices and information on application to the HUCKNALL COLLIERY COMPANY, Hucknall Torkard Collieries, near NOTTINGHAM.

GAS COAL.
POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.
One ton yields 12¼ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.
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The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.
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HAYMARKET, EDINBURGH.
Established 1840.

C. T. GRANT & CO. COAL BROKERS GLASGOW.
Scotch Churls
PRESENT PRICE:
5s. 6d. per Ton at Pit.
8s. 9d. „ F.O.B.
Cubic Feet. Illuminating Power. Coke (sup. qual.).
10,000 .. 20 candles. .. 12 cwt.

ADDISON POTTER,
WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,
Manufacturer of
CLAY RETORTS, FIRE-BRICKS, AND EVERY DESCRIPTION OF FIRE-CLAY GOODS

CANNEL COAL.
COPPA COLLIERY, MOLD,
Beg leave to call the attention of Gas Companies to the superior quality of their
CANNEL FOR GAS-MAKING PURPOSES.
This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.
Ports of shipment—Birkenhead or Connah's Quay.
Waggons supplied for delivery by railway to any part of England or Wales.
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SUPPLY THE BEST
REAL OLD SILKSTONE
GAS COAL & GAS NUTS.
CONTRACTS ENTERED INTO.

SCOTCH GAS COAL.
ROBERT CRAWFORD & CO.,
GAS AND STEAM COAL MERCHANTS,
STIRLING, N.B.,
Supply and Contract for all the principal Scotch Gas Coal (including BOGHEAD, HARTHILL, CHAPELSIDE, LESMAHAGOW, and BRAEHEAD), f.o.b., or delivered at home or abroad.
ENGLISH AND WELSH COAL AND CANNELS ALSO SUPPLIED.
Analyses and Prices on application.
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NEAR SHEFFIELD,
STRONGLY RECOMMEND A TRIAL OF THEIR
CELEBRATED SILKSTONE GAS NUTS.
Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—
(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.
Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.
These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.
APPLICATIONS FOR PRICES, &c., TO BE SENT DIRECT TO THE COLLIERY, AS ABOVE.

THE WIGAN COAL & IRON COMPANY,
LIMITED,
COLLIERY PROPRIETORS,
(HEAD OFFICES: WIGAN, LANCASHIRE; DISTRICT OFFICE: 18, BENNETT'S HILL, NEW STREET, BIRMINGHAM),
WILLIAM M'GOWAN, AGENT,
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SILKSTONE COAL COMPANY,
LIMITED,
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GAS COAL
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Purified gas per ton of coal in cubic feet (average)	10,775
Weight of coke in lbs. per ton of coal	1,465

ANALYSIS AND PRICES ON APPLICATION TO
Mr. EDMUND TAYLOR, Secretary,
ALBERT COLLIERY, NEWBOLD, NEAR CHESTERFIELD.

THE LOCHORE AND CAPLEDRAE CANNEL COAL
COMPANY, LIMITED.
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This Company request attention to the very superior quality of their Cannel Coals.

1. The following are the practical results given by Dr. Wallace, of Glasgow, of analyses of their Lochore and Capledrae Cannels:—

	Sample worked at Capledrae.	Sample worked at Lochore.
Gas per ton of coal, at 60° Fahr. and 30 inches barometric pressure . .	13,095 cubic feet.	11,760 cubic feet.
Illuminating power, in standard sperm candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	32·91	34·83
Value of 1 cubic foot of gas in grains of sperm	780	836
Equivalent of a ton of coal in pounds of sperm candles	1,459	1,404
Durability of 1 cubic foot by 5-inch flame	69 minutes.	71 minutes.
Gravity of the gas (air = 1000)	596	594

Remarks.—This (the sample from Capledrae) is a Cannel Coal of first-class quality, giving 13,000 feet of 33-candle gas. It contains only a minute proportion of sulphur, and the ash is almost quite white. The coke is of rather inferior quality.

Remarks on Sample from Lochore.—This is a Cannel Coal of first-class quality, giving a large yield of very rich gas and a coke of medium quality.

2. The following are the practical results of analyses by Dr. Wallace of the Company's Waverley Cannels:—

	Capledrae Waverley.	Lochore Waverley.
Gas per ton of coal, at 60° Fahr. and 30 inches barometer	9,120 cubic feet.	11,145 cubic feet.
Illuminating power, in standard candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	36·62	33·09
Value of 1 cubic foot of gas in grains of sperm	878	794
Equivalent of a ton of coal in pounds of sperm candles	1,145	1,264
Durability of 1 cubic foot of gas by 5-inch flame	80 minutes.	67 minutes.
Gravity of the gas (air = 1000)	677	597

Remarks on the Sample of Capledrae Waverley.—This Coal gives fully 9000 feet of gas of 36½ candles, and is admirably adapted for bringing up the quality of gas made from common coal or inferior qualities of cannel. The tests were made at a rather high temperature, this being one of the coals that stand a very high heat without serious diminution of the illuminating power of the gas The coke contains 60 per cent. of ash, and is therefore almost valueless, but the proportion of sulphur is very moderate.

Remarks on the Lochore Waverley.—This is a first-class Cannel Coal, giving 11,000 cubic feet of 33-candle gas. The quantity of sulphur is very minute, and the ash is nearly white. The coke is of inferior quality, but not wholly valueless.

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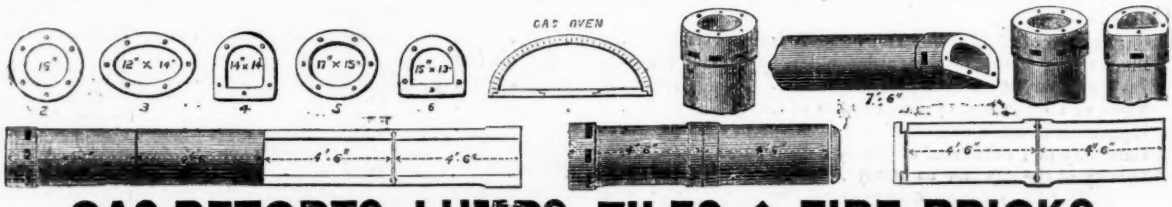

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London: Printed by WILLIAM BOUGHTON KING (at the office of Clayton and Co., 17, Bouverie Street, Fleet Street); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, August 10, 1875.